User's
Manual

MX100
Data Acquisition Unit

YOKOGAWA
Yokogawa Electric Corporation

IM MX100-01E
1st Edition

Thank you for purchasing the MX100 Data Acquisition Unit.
This user's manual contains useful information about the instrument's functions, installation and wiring procedures, operating procedures, and handling precautions of the MX100 Data Acquisition Unit. To ensure correct use, please read this manual thoroughly before beginning operation.
The seven manuals below are also provided in addition to this manual. Read them along with this manual. As with this manual, the MX100 Standard Software User's Manual (IM MX180-01E) is included in the accompanying CD-ROM.

Manual Title	Manual No.	Description
MX100 Data Acquisition Unit Operation Guide	IM MX100-02E	Describes concisely the handling of the MX100 Data Acquisition Unit and the basic operations of the MX100 Standard Software.
Precautions on the Use of the MX100 Data Acquisition Unit	IM MX100-71E	Summarizes the precautions regarding the use of the MX100 Data Acquisition Unit.
MX100 Data Acquisition Unit Installation and Connection Guide	IM MX100-72E	Describes concisely the installation procedures and wiring procedures of the DX100 Data Acquisition Unit.
MX100 Standard Software User's Manual	IM MX180-01E	Describes the functions and operations of the MX100 Standard Software that comes standard with the MX100 main module.

Notes

- **This manual describes the MX100 Data Acquisition Unit, style number "S1." Check the style number on the name plate of the main module (see page iv for the location of the name plate).**
- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer as listed on the back cover of this manual.
- Copying or reproducing all or any part of the contents of this manual without the permission of Yokogawa Electric Corporation is strictly prohibited.
- The TCP/IP software of this product and the document concerning the TCP/IP software have been developed/created by YOKOGAWA based on the BSD Networking Software, Release 1 that has been licensed from California University.

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Revisions

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Safety Precautions

About This Manual

- Please pass this manual to the end user.
- Read this manual thoroughly and have a clear understanding of the product before operation.
- This manual explains the functions of the product. It does not guarantee that the product will suit a particular purpose of the user.
- Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.
- The contents of this manual are subject to change without prior notice.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors or omissions, please contact your nearest YOKOGAWA dealer.

Precautions Related to the Protection, Safety, and Alteration of the Product

- The following safety symbols are used on the product and in this manual.

*Danger. Refer to the user's manual.*This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.)

Functional ground terminal (do not use this terminal as a protective ground terminal.)

Protective grounding terminal

Alternating current

- For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions and precautions on safety that are stated in this manual whenever you handle the product. Take special note that if you handle the product in a manner that violates these instructions, the protection functionality of the product may be damaged or impaired. In such cases, YOKOGAWA does not guarantee the quality, performance, function, and safety of product.
- When installing protection and/or safety circuits such as lightning protection devices and equipment for the product and control system or designing or installing separate protection and/or safety circuits for fool-proof design and fail-safe design of the processes and lines that use the product and the control system, the user should implement these using additional devices and equipment.
- If you are replacing parts or consumable items of the product, make sure to use parts specified by YOKOGAWA.
- This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
- Do not modify this product.

WARNING

Use the Correct Power Supply

Ensure that the source voltage matches the voltage of the power supply before turning ON the power.

Connect the Protective Grounding Terminal

Make sure to connect the protective grounding to prevent electric shock before turning ON the power.

Do Not Impair the Protective Grounding

Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so invalidates the protective functions of the instrument and poses a potential shock hazard.

Do Not Operate with Defective Protective Grounding or Fuse

Do not operate the instrument if the protective earth or fuse might be defective. Make sure to check them before operation.

Do Not Use in the Presence of Flammable Liquids, Vapors, and Dust

Do not use the instrument in the presence of flammable liquids, vapors, and dust. Operation in such environments constitutes a safety hazard.

Do Not Remove Covers

The cover should be removed by YOKOGAWA's qualified personnel only. Opening the cover is dangerous, because some areas inside the instrument have high voltages.

Ground the Instrument before Making External Connections

Connect the protective grounding before connecting to the item under measurement or to an external control unit.

Damage to the Protective Structure

Operating the instrument in a manner not described in this manual may damage its protective structure.

Exemption from Responsibility

- YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
- YOKOGAWA assumes no liability to any party for any loss or damage, direct or indirect, caused by the user or any unpredictable defect of the product.

Handling Precautions of the Software

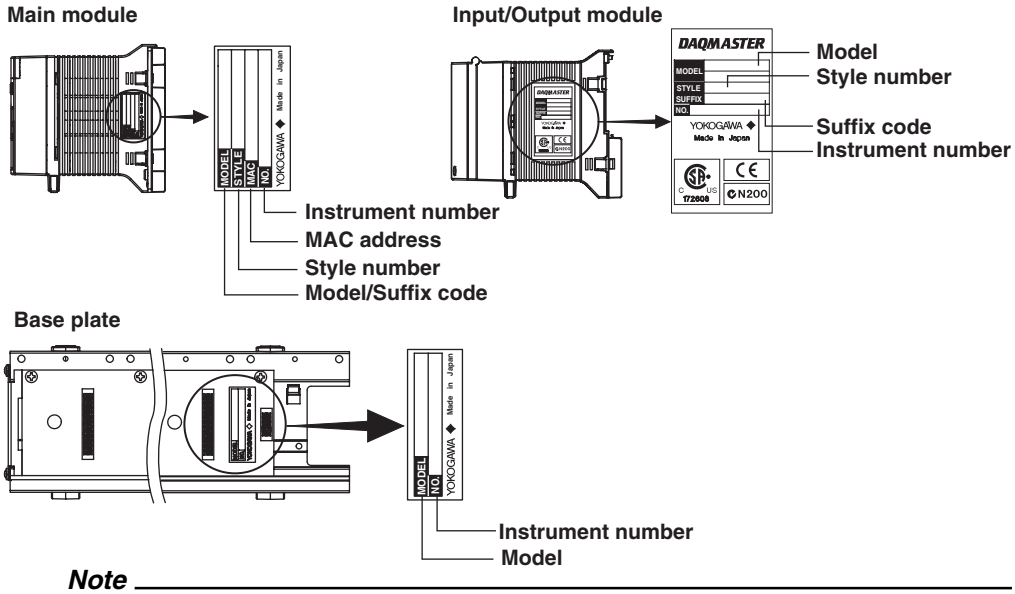
- YOKOGAWA makes no warranties regarding the software accompanying this product except those stated in the WARRANTY that is provided separately.
- Use the software on a single PC.
- You must purchase another copy of the software, if you are to use the software on another PC.
- Copying the software for any purposes other than backup is strictly prohibited.
- Please store the original media containing the software in a safe place.
- Reverse engineering, such as decompiling of the software, is strictly prohibited.
- No portion of the software supplied by YOKOGAWA may be transferred, exchanged, or sublet or leased for use by any third party without prior permission by YOKOGAWA.

Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument. If some of the contents are not correct, or if any items are missing or damaged, contact the dealer from whom you purchased them.

Checking the Model and Suffix Code

Check the model and suffix code on the name plate indicated in the figure below.



Note

When contacting the dealer from which you purchased the instrument, please give them the NO. (instrument number) on the name plate.

Main Module

Model	Suffix Code		Description
MX100			MX100 main module
Manual language	-E		English (comes with an English manual)
Supply voltage	-1		100 VAC-240 VAC
Power supply and power cord		-D	3-pin inlet, UL/CSA Standard power cord [Maximum rated voltage: 125 V; Maximum rated current: 7 A]
		-F	3-pin inlet, VDE Standard power cord [Maximum rated voltage: 250 V; Maximum rated current: 10 A]
		-R	3-pin inlet, AS Standard power cord [Maximum rated voltage: 240 V; Maximum rated current: 10 A]
		-Q	3-pin inlet, BS Standard power cord [Maximum rated voltage: 250 V; Maximum rated current: 10 A]
		-H	3-pin inlet, GB Standard power cord (complies with CCC) [Maximum rated voltage: 250 V; Maximum rated current: 10 A]
		-W	Screw terminal (does not come with a power cord)

Universal Input Module

Model	Suffix Code	Optional Code	Description
MX110			MX100 universal input module
Input type	-UNV		For DCV/TC/DI/RTD input
Number of channels and measurement interval	-H04		4-CH, high-speed measurement (minimum measurement interval: 10 ms)
	-M10		10-CH, medium-speed measurement (minimum measurement interval: 100 ms)
Options		/NC*	Without the plate with the clamp terminals

* The /NC option can be specified only when -M10 is specified.

Digital Input Module

Model	Suffix Code	Optional Code	Description
MX115			MX100 digital input module
Input type	-D05		Non-voltage contact, 5-V logic, open collector input
Number of channels and measurement interval	-H10		10-CH, high-speed measurement (minimum measurement interval: 10 ms)
Options		/NC	Without the plate with the clamp terminals

Digital Output Module

Model	Suffix Code	Description
MX125		MX100 digital output module
Output type	-MKC	A contact output
Number of channels and output interval	-M10	10-CH, minimum output interval: 100 ms

Base Plate

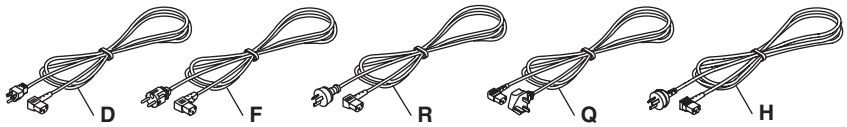
Model	Suffix Code	Description
MX150		MX100 base plate (includes two brackets for DIN rail mount)
Base type	-1 to -6	The value of the suffix code corresponds to the maximum number of input/output modules that can be installed. Example: MX150-3 is for one main module and three input/output modules MX150-6 is for one main module and six input/output modules

Standard Accessories

The following standard accessories are supplied with the main module. Check that all contents are present and that they are undamaged.

Power Cord (one of the following power cords is supplied according to the instrument's suffix codes)

UL/CSA Standard A1006WD | **VDE Standard A1009WD** | **AS Standard A1024WD** | **BS Standard A1054WD** | **GB Standard (complies with CCC) A1064WD**



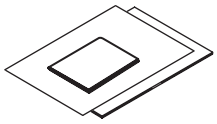
*** Not included when screw terminals are specified for the power section (Suffix code: W).**

MX100 Standard Software
Model: MX180

MX100 Manual CD-ROM**
Part number: B8722XH

**** Contains this manual (IM MX100-01E) and the MX100 Standard Software User's Manual (IM MX180-01E).**

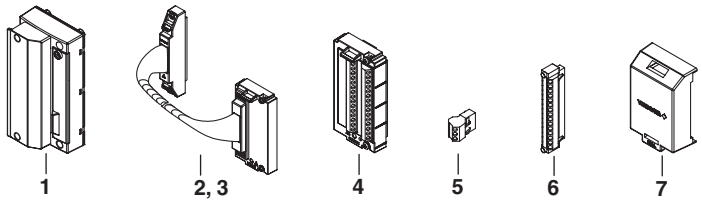
Paper Manuals



- **MX100 Data Acquisition Unit Operation Guide (IM MX100-02E)**
- **Precautions on the Use of the MX100 Data Acquisition Unit (IM MX100-71E)**
- **MX100 Data Acquisition Unit Installation and Connection Guide (IM MX100-72E)**

Optional Accessories (Sold Separately)

No.	Name	Model	Minimum Q'ty	Note
1	10-CH screw terminal block	772061	1	Dedicated to the MX110-UNV-M10/ MX115-D05-H10
2	Connection cable between the input module and screw terminal block	772062-050	1	Cable length: 50 cm
3	Connection cable between the input module and screw terminal block	772062-100	1	Cable length: 100 cm
4	Plate with clamp terminals	772063	1	Dedicated to the MX110-UNV-M10/ MX115-D05-H10
5	Clamp terminal	772064	1	Dedicated to the MX110-UNV-H04
6	Clamp terminal	772065	1	Dedicated to the MX125-MKC-M10
7	Connector cover	772066	1	For empty slots
8	Shunt resistor (for the clamp terminal)	438920	1	Resistance: 250 Ω±0.1%
9	Shunt resistor (for the clamp terminal)	438921	1	Resistance: 100 Ω±0.1%
10	Shunt resistor (for the clamp terminal)	438922	1	Resistance: 10 Ω±0.1%
11	Shunt resistance (for the screw terminal)	415920	1	Resistance: 250 Ω±0.1%
12	Shunt resistance (for the screw terminal)	415921	1	Resistance: 100 Ω±0.1%
13	Shunt resistance (for the screw terminal)	415922	1	Resistance: 10 Ω±0.1%



Application Software (Sold Separately)

The following two application programs are available for purchase separately.

- MXLOGGER (WX103)
- API for the MX100/DARWIN (MX190)

Conventions Used in This Manual

Unit

K: Denotes 1024. Example: 5 KB (file size)

k: Denotes 1000.

Safety Markings

The following markings are used in this manual.

Danger. Refer to corresponding location on the instrument. This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.

WARNING Calls attention to actions or conditions that could cause serious injury or death to the user, and precautions that can be taken to prevent such occurrences.

CAUTION Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

Note Calls attention to information that is important for proper operation of the instrument.

Contents

Safety Precautions ii
Checking the Contents of the Package iv
Conventions Used in This Manual vii

Chapter 1 Explanation of Functions

1.1 Overview of the MX100 Data Acquisition Unit 1-1
Main Module 1-2
Input/Output Modules 1-2
Base Plate 1-3
PC Software 1-3
1.2 Main Module Functions 1-5
Communications 1-5
Measurement 1-5
Filter 1-6
Computation 1-6
Remote RJC 1-6
Alarms 1-6
Contents Displayed on the 7-Segment LED 1-7
Saving Data to the CF Card 1-8
1.3 Functions of the 4-CH, High-Speed Universal Input Module 1-10
Input Type and Measurement Range 1-10
Measurement Interval, Integration Time, and Filter 1-11
Measurement Synchronization 1-11
Common Mode Voltage 1-11
1.4 Functions of the 10-CH, Medium-Speed Universal Input Module 1-12
Input Type and Measurement Range 1-12
Measurement Interval, Integration Time, and Filter 1-13
Measurement Synchronization 1-13
Common Mode Voltage 1-13
1.5 Functions of the 10-CH, High-Speed Digital Input Module 1-14
Measurement Interval 1-14
Filter 1-14
1.6 Functions of the 10-CH, Medium-Speed Digital Output Module 1-15
Output Type 1-15
Output Update Interval 1-15
Relay Action and Hold Behavior 1-15

Chapter 2 Installation and Wiring

2.1 Handling Precautions 2-1
2.2 Installation 2-2
Installation Location 2-2
Installation Procedure 2-3
2.3 Attaching the Modules 2-4
Attachment Procedure 2-4
Attachment Positions and Channel Numbers 2-4
2.4 Connecting the Signal Wires 2-5
Terminal Arrangement Markings on the Terminal Cover 2-5
Attaching and Removing the Terminal Block 2-5
Screw Terminal Block 2-5

General Precautions When Wiring the Input/Output Signal Wires 2-6
Wiring Procedure 2-7
Wiring the Universal Input Module 2-7
Wiring the Digital Input Module 2-8
Wiring the Digital Output Module 2-8
2.5 Power Connection and ON/OFF 2-9
Connection Procedure Using the Power Cord
(When the Suffix Code of the Power Supply and Power Cord Is D) 2-9
Wiring Procedure to the Power Supply Terminal
(When the Suffix Code of the Power Supply and Power Cord Is W) 2-10
Turning ON/OFF the Power Switch 2-10
2.6 Connecting the Ethernet Cable 2-11
Connection Procedure 2-11
Checking the Communication Status 2-12
Initializing the Settings 2-12
2.7 Measures against Noise on the MX100 Data Acquisition Unit 2-13
Integrating A/D Converter 2-13
First-Order Lag Filter 2-14
2.8 Handling of the CF Card 2-15
Handling Precautions of the CF Card 2-15
Inserting the CF Card 2-15
Ejecting the CF Card 2-15

Chapter 3 Troubleshooting and Maintenance

3.1 Error Display on the 7-Segment LED and Corrective Actions 3-1
Errors at Power ON 3-1
System Errors 3-1
Module Errors 3-2
Media-Related Errors. 3-2
Communication Errors 3-2
3.2 Troubleshooting 3-3
3.3 Calibration 3-5
Calibration of the Measurement Range of the DC Voltage and RTD 3-5
Calibration of Temperature Measurements using Thermocouples 3-7
3.4 Maintenance of Parts 3-8
3.5 MX100 Maintenance and Test Using Communication Commands 3-9
Connecting the Main Module and the PC 3-9
Setting the Terminal Emulator 3-9
List of Maintenance/Test Commands 3-9
Specifications of the Maintenance/Test Port 3-9

Chapter 4 Specification

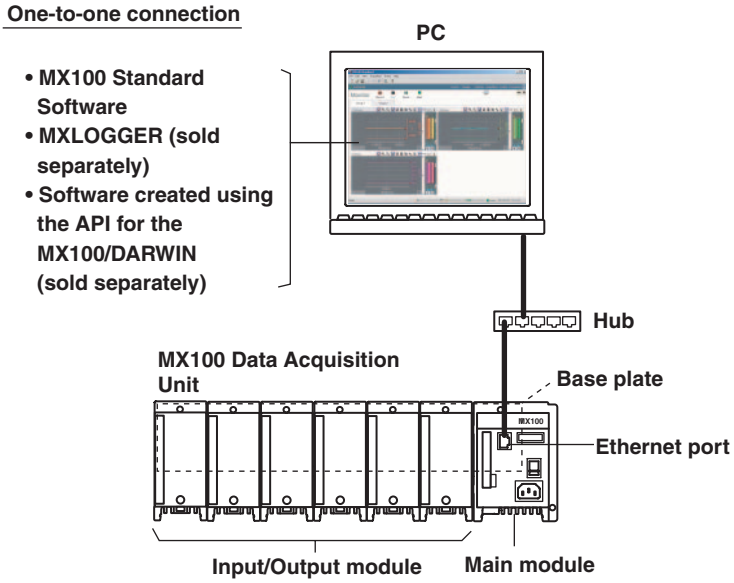
4.1 Common Specifications 4-1
4.2 Main Module Specifications 4-2
4.3 Base Plate Specifications 4-7
4.4 4-CH, High-Speed Universal Input Module Specifications 4-8
4.5 10-CH, Medium-Speed Universal Input Module Specifications 4-12
4.6 10-CH, High-Speed Digital Input Module Specifications 4-17
4.7 10-CH, Medium-Speed Digital Output Module Specifications 4-18

Index

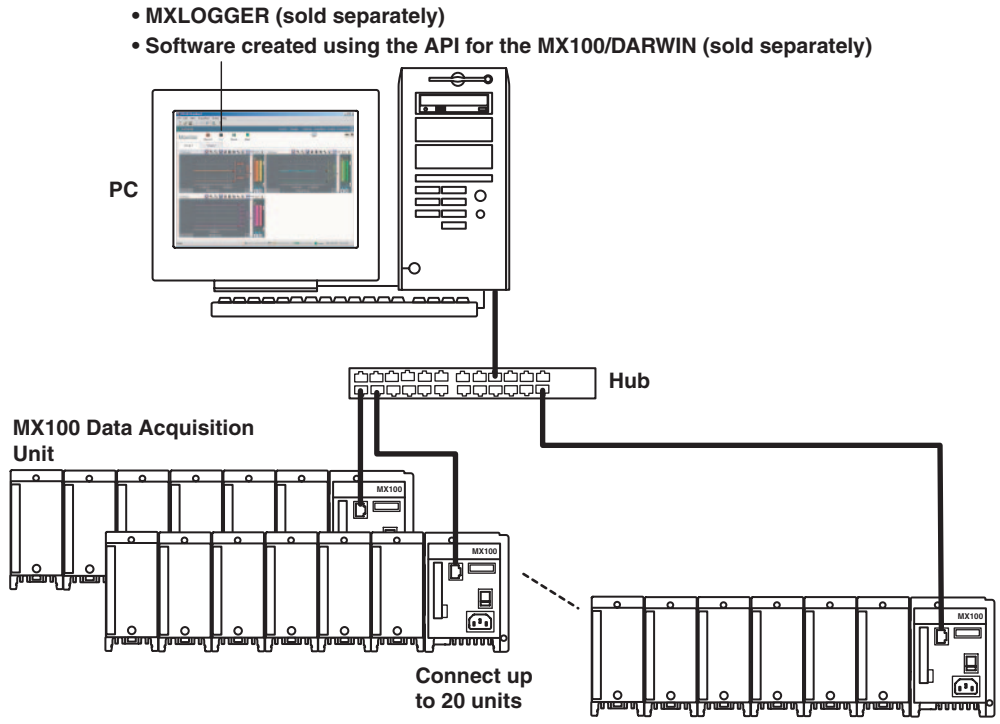
1.1 Overview of the MX100 Data Acquisition Unit

The MX100 Data Acquisition Unit consists of (1) the main module equipped with an Ethernet port, (2) input/output modules that perform input or output of signals, and (3) the base plate that attaches and connects the modules. By connecting the main module and a PC via the Ethernet interface and installing the dedicated software program indicated below into the PC, you can configure the acquisition conditions of the measured data from the PC as well as monitor and acquire the measured data on the PC. One to 20 MX100 Data Acquisition Units can be connected to a single PC (one unit using the MX100 Standard Software, one to 20 units (or up to 1200 input channels) using the MXLOGGER).

One-to-one connection

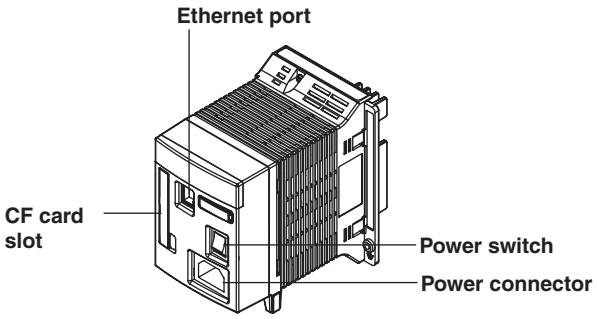


One-to-N connection


• MXLOGGER (sold separately)
• Software created using the API for the MX100/DARWIN (sold separately)
PC
Hub
MX100 Data Acquisition Unit
Connect up to 20 units

Main Module

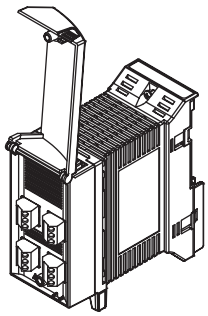
The main module is equipped with a power supply connector, a power switch, an Ethernet port, a CF card slot, and other parts. It contains functions such as the power supply to and the control of each input/output module, communications with a PC, data storage to the CF card when communication is disconnected.



Input/Output Modules

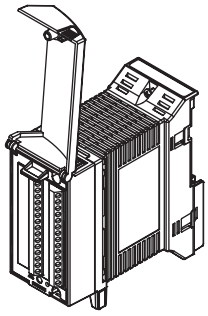
The following four types of modules are available. All modules use clamp terminals. A separate screw terminal board (sold separately) is available for the 10-CH, Medium-Speed Universal Input Module and the 10-CH, High-Speed Digital Input Module.

4-CH, High-Speed Universal Input Module (MX110-UNV-H04)



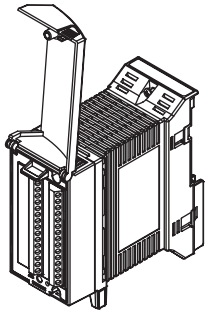
- **Minimum measurement interval: 10 ms (except 50 ms for temperature measurement**
- **Maximum number of inputs: 4 inputs**
- **Input types: DC voltage, TC, RTD, and DI (LEVEL, contact)**

10-CH, Medium-Speed Universal Input Module (MX110-UNV-M10)



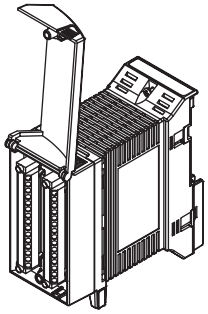
- **Minimum measurement interval: 100 ms**
- **Maximum number of inputs: 10 inputs**
- **Input types: DC voltage, TC, RTD, and DI (LEVEL, contact)**

10-CH, High-Speed Digital Input Module (MX115-D05-H10)



- **Minimum measurement interval: 10 ms**
- **Maximum number of inputs: 10 inputs**
- **Input types: DI (non-voltage contact, open collector, 5-V logic)**

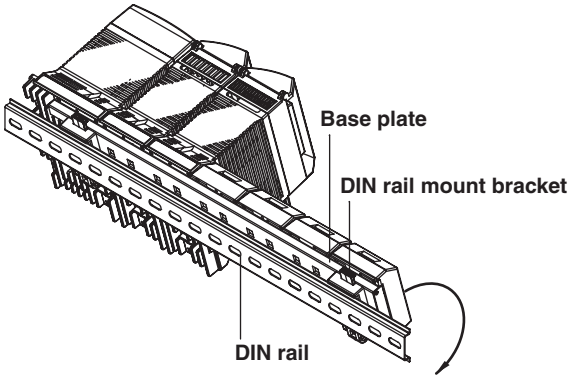
10-CH, Medium-Speed Digital Output Module (MX125-MKC-M10)



- Output update interval: 100 ms (fixed)
- Maximum number of outputs: 10 outputs
- Output type: A contact (SPST)

Base Plate

The base plate is equipped with connectors for connecting the main module and input/output modules. There are six types of base plates available (connects various number of input/output modules from one to six). You can rack-mount or panel-mount the MX100 by attaching a DIN rail mount bracket to this base plate.

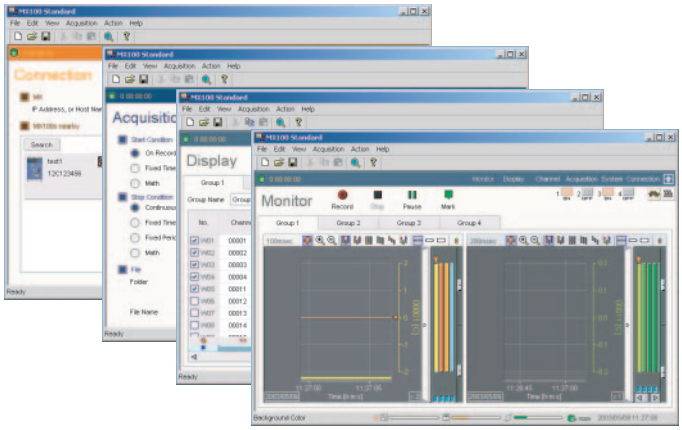


PC Software

The MX100 Standard Software comes standard. It allows one MX100 Data Acquisition Unit to be connected to a PC and performs measurement data acquisition. The MX100 Standard Software consists of the three software programs below. For details about the software functions and the operating procedure, see the MX100 Standard Software User's Manual.

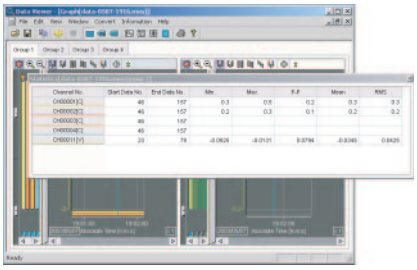
Integration Monitor

Enables you to connect or disconnect communications, configure acquisition conditions and display conditions of the measurement channels, set up computations channels, monitor measured and computed data, save measured and computed data, and carry out other operations.



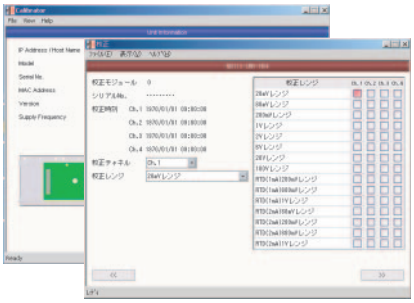
Viewer

Enables you to (1) display measured and computed data that has been stored, (2) read values and perform computation over an area using cursors, and (3) convert the measured and computed data into various file formats such as Excel.



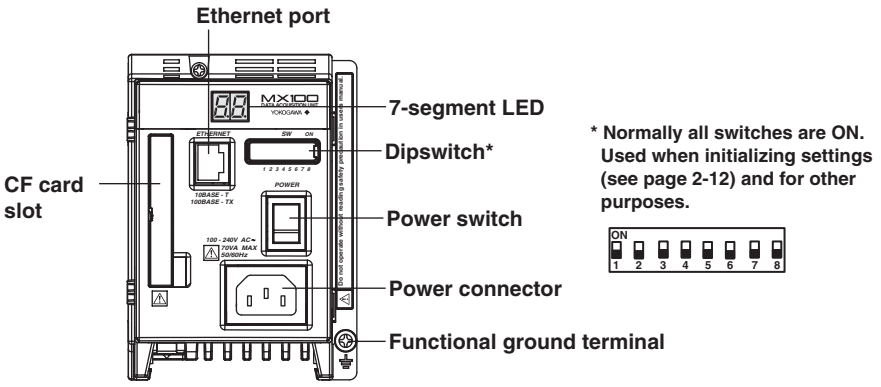
Calibrator

This program is used to calibrate the universal input modules of the MX100.



1.2 Main Module Functions

The main module is the heart of the MX100 Data Acquisition Unit.

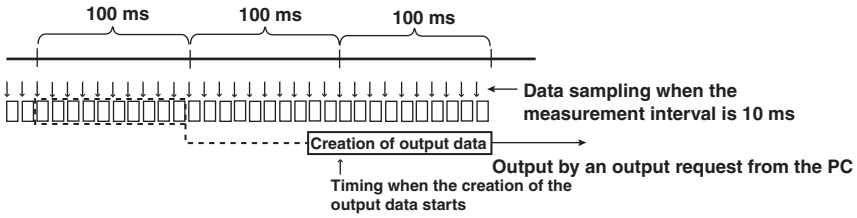

Ethernet port
7-segment LED
Dipswitch*
CF card slot
Power switch
Power connector
Functional ground terminal
* Normally all switches are ON. Used when initializing settings (see page 2-12) and for other purposes.
ON
1 2 3 4 5 6 7 8

Communications

The main module is equipped with one auto-negotiating 10BASE-T/100BASE-TX Ethernet port. The LEDs at the upper-left and lower-left of the port indicate the communication status via the Ethernet interface.

Measurement

The main module acquires measurement data sampled at specified intervals on each input module. Then, it performs correcting computation and physical conversion on the measured data and transmits the data to a PC via the Ethernet interface at 100-ms intervals minimum. Even if the input modules are sampling at intervals less than 100 ms (10 ms or 50 ms), the data is transmitted collectively at 100-ms intervals.
In addition, the main module receives output commands sent from the PC as necessary and generates signal output instructions to the output modules.


100 ms
100 ms
100 ms
Data sampling when the measurement interval is 10 ms
Creation of output data
Output by an output request from the PC
Timing when the creation of the output data starts

Synchronization of Measurements

- Synchronization between modules
  If set to the same measurement interval, measurements made by input modules in the same acquisition unit are synchronized.
- Synchronization between channels
  On 4-CH, High-Speed Universal Input modules, measurements between channels are synchronized.
  On 10-CH, Medium-Speed Universal Input modules, measurements are made sequentially one channel at a time. Therefore, measurements are not synchronized between channels (we can consider them synchronized within the measurement interval).

Measurement Times

When a measurement start request or a measurement data output request is made by a PC against the main module, the PC's time information is transmitted to the main module. The main module generates measurement time using the internal clock based on the time when the measurement start request is received. When the measured data is sent to the PC, the PC's time information along with the measurement time information on the main module is transmitted to the PC. The time information used in the monitoring of the measured data on the PC is that of the main module.
When measurement is made over extended time, the time between the PC and main module may be misaligned (up to 60 seconds in one week excluding the accuracy of the PC clock). As a remedy to this problem, when the measured data is recorded (saved) on the PC, the PC's time information is stored along with the measurement time information on the main module. When the Viewer of the MX100 Standard Software is used to open the recorded measurement data, the "time synchronization" function can be used to correct the measurement time relative to the PC's time based on the PC's time information. For details on the "time synchronization" function, see Technical Information "MX100 Performance Specifications" (TI04M08B01-00E). For information on obtaining a copy, contact your nearest YOKOGAWA dealer.

Filter

The main module is equipped with first-order lag filter (see section 2.7, "Measures against Noise on the MX100 Data Acquisition Unit). You can select a time constant (time until 63.2% of the output value is reached) corresponding to the measurement interval indicated in the equation below.
Time constant = measurement interval × N (where N = 5, 10, 20, 25, 40, 50, or 100)

Computation

Difference computation between channels and linear scaling are possible. Linear scaling converts the measured values to values suitable for a purpose (scaled values) using the following equation.

$$\text{Scale value} = \frac{(X - SP_{min}) \times (SC_{max} - SC_{min})}{SP_{max} - SP_{min}} + SC_{min}$$

X: Measured value
SP_{max}: Specified span maximum
SP_{min}: Specified span minimum
SC_{max}: Specified scale maximum
SC_{min}: Specified scale minimum

Remote RJC

When the item to be measured is located at a great distance, you can setup relay terminals near the item, measure between the relay terminal and the input terminal of the universal input module (reference channel) using thermocouples, and use the resultant value as the reference junction compensation of the temperature measurement. By connecting the relay terminal and the input terminal of the universal input module using copper wires and connecting the item to be measured and the relay terminal using thermocouples, you can make temperature measurements without having to use large quantities of high-cost thermocouples.

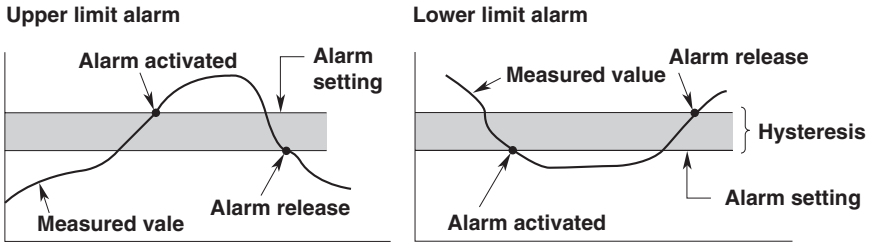
Alarms

The main module compares the measured values against preset alarm values and outputs alarm signals based on the result from the digital output module. The following four types of alarms can be output.

- Upper limit alarm
  Generates an alarm when the measured value exceeds the alarm value.
- Lower limit alarm
  Generates an alarm when the measured value falls below the alarm value.
- Differential upper limit alarm (during difference computation)
  Generates an alarm when the difference in the measured values of two channels exceeds the alarm value.
- Differential low limit alarm (during difference computation)
  Generates an alarm when the difference in the measured values of two channels falls below the alarm value.

Alarm Value Hysteresis

You can set a width (hysteresis) to the values used to activate and release alarms. Alarm hysteresis can prevent frequent activation and release of alarms when the measured value is unstable around the alarm value.



Alarm Output Timing

The output interval is 100 ms. Therefore, when the measurement interval is 10 ms or 50 ms, the alarm output data is accumulated over 100-ms intervals and output at 100-ms intervals based on the accumulated data.

Contents Displayed on the 7-Segment LED

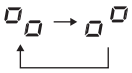
The two-digit 7-segment LED displays the unit number, operating status, operation complete, and operation error of the MX100 Data Acquisition Unit.

Unit Number Display

Since a single MX100 Data Acquisition Unit can be connected to a PC on the MX100 Standard Software, the unit number is fixed to 00 and displayed as 00. When using MXLOGGER (software sold separately) that allows up to 20 MX100 Data Acquisition Units to be connected, the unit number can be set in the range of 00 to 19 and displayed as 00 to 19.

Display of the Self-Test Operation at Power on

When the power is turned ON, the LED displays startup indications (such as 88), and a self-test is carried out. While the self-test is in progress, the following displays are repeated.



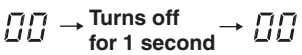
Operation Mode Display

The MX100 Data Acquisition Unit has three operation modes: idle mode, measurement mode, and backup mode (measured data saved to a CF card due to the disconnection of communications). The modes are displayed as shown below. In the figure below, 00 indicates the unit number. If the unit number is not 00, the specified unit number is displayed.

- **Idle mode**: 00 — Two zeroes
- **Measurement mode**: 00. — Two zeroes and a dot
- **Backup mode**: 0.0. — Two zeroes and two dots

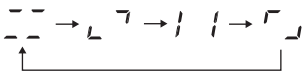
Display When Operation Is Complete

The figure below shows the display that appears when an operation such as IP address configuration and measurement condition change is completed. In the figure below, 00 indicates the unit number. If the unit number is not 00, the specified unit number is displayed.



Display While Processing Is in Progress

The displays shown below repeats when there is access to the CF card, when the CF card is being formatted, or when calibration is taking place.



Unit Confirmation Display

The figure below shows the display that appears when you confirm the MX100 Data Acquisition Unit that is connected using the MX100 Standard Software or MXLOGGER (software sold separately). The word "—CALL—" flows through the display from right to left.

For details on the display and meaning of operation errors, see section 3.1, "Error Display on the 7-Segment LED and Corrective Actions."

Saving Data to the CF Card

Data Saving When Communication Is Disconnected

If communication is disconnected while the PC is recording (saving) measured data and a 60-s timeout* expires, the measured data is saved to the CF card at 60-s intervals. When the save operation is started, a file is created for each measurement interval (referred to as monitor interval on the MX100 Standard Software). As the save operation progresses and the file for the shortest measurement interval reaches 5 MB, the file is closed. At the same time, files for other measurement intervals (files that have not reached 5 MB) are also closed. Then, a new file is created for each measurement interval setting once again, and the save operation continues. When the communication with the PC resumes and acquisition of measured data resumes, the save operation automatically stops. To manually stop the operation, press the access stop switch (see section 2.8) located above the CF card slot on the main module.

The table below shows the interval (a guideline) over which data can be saved to the CF card when one type of measurement interval is used.

* The time from the point when the communication between the PC and MX100 is disconnected and acquisition of measured data is stopped to the point when data storage to the CF card starts.

Number of Saved CHs	Measurement Interval	Capacity of the CF card				
		32 MB (6 files)	64 MB (12 files)	128 MB (25 files)	256 MB (51 files)	512 MB (102 files)
10 CHs	10 ms	2 hours	4 hours	9 hours	18 hours	36 hours
	50 ms	10 hours	21 hours	45 hours	3 days	7 days
	100 ms	21 hours	43 hours	3.5 days	7 days	15 days
	200 ms	43 hours	3 days	7 days	15 days	30 days
	500 ms	4.5 days	9 days	18.5 days	38 days	75.5 days
	1 s	9 days	18 days	37 days	77 days	154 days
	2 s	18 days	36 days	75.5 days	154 days	303 days
24 CHs	10 ms	54 min.	1 hour40 min.	3.5 hours	7 hours	15 hours
	50 ms	4 hours	9 hours	18 hours	38 hours	77 hours
	100 ms	9 hours	18 hours	37 hours	77 hours	6 days
	200 ms	18 hours	36 hours	75 hours	6 days	12 days
	500 ms	45 hours	3 days	7.5 days	16 days	31.5 days
	1 s	3 days	7 days	15 days	32 days	64 days
	2 s	7.5 days	15 days	31.5 days	64 days	126 days
60 CHs	10 ms	18 min.	40 min.	1 hour15 min.	3 hours	5 hours
	50 ms	1 hour	3 hours	7 hours	15 hours	30 hours
	100 ms	3.5 hours	7 hours	15 hours	30 hours	2.5 days
	200 ms	7 hours	14 hours	30 hours	2 days	5 days
	500 ms	18 hours	36 hours	3 days	6 days	12.5 days
	1 s	36 hours	3 days	6 days	12 days	25 days
	2 s	3 days	6 days	12.5 days	25 days	50 days

For a description of other specifications related to data storage, see "Data Storage" in section 4.2, "Main Module Specifications."

Use of the Measured Data Saved to the CF Card

The Viewer of the PC software can be used to display the measured data saved to the CF card. However, time synchronization processing is not possible. To connect the data before disconnection (saved to the PC) and the data after disconnection (saved to the CF card), open the CF card data using the PC software and convert to Excel format. Then, insert the data in the appropriate place in the data before disconnection using copy and paste or other means. Note that when the communication with the PC is resumed, the PC software acquires as much retraceable data as possible. Therefore, a portion of the data saved to the CF card and the data recorded by the PC software overlaps.

Log File Storage

In addition to the measured data that is saved when the communication with the PC is disconnected, a log file of information related to the CF card operation and information of power ON/OFF is saved to the CF card in text format (MX100MLG.TXT). The maximum size of the log file is 40 KB. Up to 1021 events can be stored. When 1021 events are exceeded, the event is deleted in order from the oldest information. The log is written (overwritten to the same file name) to the CF card when you press the access stop switch (see section 2.8).

- **Information Saved to the Log File**
  - Date/Time when the power is turn ON or OFF.
  - Date/Time when the CF card is inserted or removed.
  - Save mode when data is saved (backup) and the log of start/stop.
  - The log of file creation and deletion.
  - Media-related errors.
  - The log of CF card format.

- **Log File Example**

```
Yokogawa DAQMASTER MX100 <Media Info>
  Date     Time   Status  Message
70/01/01 00:00:00 Power   off
03/01/01 00:00:01 Power   on
03/03/25 10:12:13 Format  ok
03/03/25 11:14:12 Backup  start
03/03/25 11:14:12 Mode    rotary
03/03/25 11:14:13 Delete  (--)
03/03/25 11:14:21 Create  32500000
03/03/25 11:14:36 Code    12 MF
03/03/25 11:14:36 Error   P3
03/03/25 11:14:54 Backup  stop
03/03/25 11:15:18 Create  MX100MLG
03/03/25 11:15:22 Card    out
03/03/25 11:15:25 Card    in
>>
```

Time indicating that the settings have been initialized*
Time after resetting the internal clock*
Media error (records the error code)
Most-recent information
Termination mark

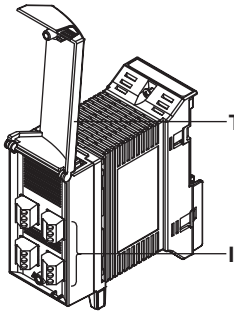
*** When the MX100 is initialized, the date/time on the MX100 is reset to 1970/01/01 00:00:00 once, then to the default value on the MX100 (2003/01/01 00:00:00). Then, when the PC software is started and connection to the MX100 is made, the current date/time on the PC is transmitted to the MX100. The MX100 is reset to the received date/time.**

CF Card Specifications

Item	Specification
Capacity	2 GB maximum
Type	Type I or Type II
Format	Supports quick (logical) format. 1 partition format (hard disk format) is possible only through a command from the PC when the MX operation mode is idle.
File system	FAT

1.3 Functions of the 4-CH, High-Speed Universal Input Module

This module is equipped with four inputs and measures DC voltage, TC, RTD, and digital input (DI) at a minimum measurement interval of 10 ms (the minimum interval is 50 ms if the input type is thermocouple or RTD).



Input Type and Measurement Range

The following measurements are possible.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	20 mV	–20.000 to 20.000mV
	60 mV	–60.00 to 60.00mV
	200 mV	–200.00 to 200.00mV
	2 V	–2.0000 to 2.0000V
	6 V	–6.000 to 6.000V
	20 V	–20.000 to 20.000V
	100 V	–100.00 to 100.00V
Thermocouple	R	0.0 to 1760.0°C
	S	
	B	0.0 to 1820.0°C
	K	–200.0 to 1370.0°C
	E	–200.0 to 800.0°C
	J	–200.0 to 1100.0°C
	T	–200.0 to 400.0°C
	L	–200.0 to 900.0°C
	U	–200.0 to 400.0°C
	N	0.0 to 1300.0°C
	W	0.0 to 2315.0°C
	KPvsAu7Fe	0.0 to 300.0K
RTD (Measurement current:1 mA)	Pt100	–200.0 to 600.0°C
	JPt100	–200.0 to 550.0°C
	Pt100 (high resolution)	–140.00 to 150.00°C
	JPt100 (high resolution)	–140.00 to 150.00°C
	Ni100 SAMA	–200.0 to 250.0°C
	Ni100 DIN	–60.0 to 180.0°C
	Ni120	–70.0 to 200.0°C
RTD (Measurement current: 2 mA)	Pt100	–200.0 to 250.0°C
	JPt100	–200.0 to 250.0°C
	Pt100 (high resolution)	–140.00 to 150.00°C
	JPt100 (high resolution)	–140.00 to 150.00°C
	Pt50	–200.0 to 550.0°C
	Cu10 GE	–200.0 to 300.0°C
	Cu10 L&N	–200.0 to 300.0°C
	Cu10 WEED	–200.0 to 300.0°C
	Cu10 BAILEY	–200.0 to 300.0°C
	J263B	0.0 to 300.0K
DI	Level	Vth = 2.4V
	Contact input	ON: 100 Ω or less, OFF: 10 kΩ or more

The following inputs can be used on MXLOGGER or MX100/DARWIN API sold separately. These inputs cannot be used on the MX100 Standard Software.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	60mV (high resolution)	0.000 to 60.000mV
	1V	–1.0000 to 1.0000V
	6V (high resolution)	0.0000 to 6.0000V
Thermocouple	PLATINEL	0.0 to 1400.0°C
	PR40-20	0.0 to 1900.0°C
	NiNiMo	0.0 to 1310.0°C
	WRe3-25	0.0 to 2400.0°C
	W/WRe26	0.0 to 2400.0°C
	Type-N(AWG14)	0.0 to 1300.0°C
RTD (Measurement current:1 mA)	Pt100 (high noise resistance)	–200.0 to 600.0°C
	JPt100 (high noise resistance)	–200.0 to 550.0°C
RTD (Measurement current: 2 mA)	Cu10 at 20°C alpha = 0.00392	–200.0 to 300.0°C
	Cu10 at 20°C alpha = 0.00393	–200.0 to 300.0°C
	Cu25 at 0°C alpha = 0.00425	–200.0 to 300.0°C
	Cu53 at 0°C alpha = 0.00426035	–50.0 to 150.0°C
	Cu100 at 0°C alpha = 0.00425	–50.0 to 150.0°C
	Pt25(JPt100*1/4)	–200.0 to 550.0°C
	Cu10 GE (high resolution)	–200.0 to 300.0°C
	Cu10 L&N (high resolution)	–200.0 to 300.0°C
	Cu10 WEED (high resolution)	–200.0 to 300.0°C
	Cu10 BAILEY (high resolution)	–200.0 to 300.0°C
	Pt100 (noise resistance)	–200.0 to 250.0°C
	JPt100 (noise resistance)	–200.0 to 250.0°C

Measurement Interval, Integration Time, and Filter

The table below shows the available measurement intervals. The module is equipped with an integrating A/D converter. The selectable integration time varies depending on the measurement interval as shown in the table below. For details about the relationship between noise and integration time, see section 2.7, “Measures against Noise on the MX100 Data Acquisition Unit.” In addition, the type of noise rejection filter switches as shown in the table below.

Measurement Interval	Integration Time	Filter	Rejected Noise and Notes
10 ms	1.67 ms	Rectangular	600 Hz and its integer multiples, temperature measurement not possible
50 ms	16.67 ms		60 Hz and its integer multiples
	20 ms		50 Hz and its integer multiples
	Auto		Automatically detects the power supply frequency and set 16.67 or 20 ms
100 ms	36.67 ms	Trapezoidal	50 Hz or 60 Hz and their integer multiples
200 ms			
500 ms	100 ms	Rectangular	10 Hz and its integer multiples
1 s	200 ms	Cos	Fc = 5-Hz low-pass filter
2, 5,10, 20, 30, 60 s			

Measurement Synchronization

Each input channel has its own A/D converter. Therefore, measurements on each channel are synchronized.

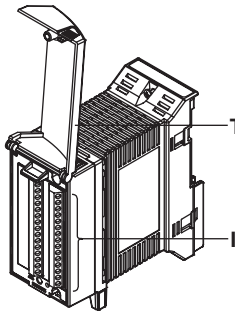
Common Mode Voltage

The common mode voltage between channels in a single module is 250 VACrms when the signal is applied continuously.

The common mode voltage between modules and between a module and earth is 600 VACrms when the signal is applied continuously.

1.4 Functions of the 10-CH, Medium-Speed Universal Input Module

This module is equipped with ten inputs and measures DC voltage, TC, RTD, and digital input (DI) at a minimum measurement interval of 100 ms.



Input Type and Measurement Range

The following measurements are possible.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	20 mV	–20.000 to 20.000 mV
	60 mV	–60.00 to 60.00 mV
	200 mV	–200.00 to 200.00 mV
	2 V	–2.0000 to 2.0000 V
	6 V	–6.000 to 6.000 V
	20 V	–20.000 to 20.000 V
	100 V	–100.00 to 100.00 V
Thermocouple	R	0.0 to 1760.0°C
	S	
	B	0.0 to 1820.0°C
	K	–200.0 to 1370.0°C
	E	–200.0 to 800.0°C
	J	–200.0 to 1100.0°C
	T	–200.0 to 400.0°C
	L	–200.0 to 900.0°C
	U	–200.0 to 400.0°C
	N	0.0 to 1300.0°C
	W	0.0 to 2315.0°C
	KPvsAu7Fe	0.0 to 300.0K
RTD (Measurement current:1 mA)	Pt100	–200.0 to 600.0°C
	JPt100	–200.0 to 550.0°C
	Pt100 (high resolution)	–140.00 to 150.00°C
	JPt100 (high resolution)	–140.00 to 150.00°C
	Ni100 SAMA	–200.0 to 25.00°C
	Ni100 DIN	–60.0 to 180.0°C
	Ni120	–70.0 to 200.0°C
	Pt50	–200.0 to 550.0°C
	Cu10 GE	–200.0 to 300.0°C
	Cu10 L&N	–200.0 to 300.0°C
	Cu10 WEED	–200.0 to 300.0°C
	Cu10 BAILEY	–200.0 to 300.0°C
	J263B	0.0 to 300.0K
DI	Level	Vth = 2.4 V
	Contact input	ON: 1 kΩ or less, OFF: 100 kΩ or more (parallel capacitance: 0.01 μF or less)

The following inputs can be used on MXLOGGER or MX100/DARWIN API sold separately. These inputs cannot be used on the MX100 Standard Software.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	60mV (high resolution)	0.000 to 60.000 mV
	1V (high resolution)	–1.0000 to 1.0000 V
	6V (high resolution)	0.0000 to 6.0000 V
Thermocouple (excludes RTD accuracy, when burnout is OFF)	PLATINEL	0.0 to 1400.0°C
	PR40-20	0.0 to 1900.0°C
	NiNiMo	0.0 to 1310.0°C
	WRe3-25	0.0 to 2400.0°C
	W/WRe26	0.0 to 2400.0°C
	Type-N(AWG14)	0.0 to 1300.0°C
RTD (Measurement current:1 mA)	Cu10 at 20°C alpha = 0.00392	–200.0 to 300.0°C
	Cu10 at 20°C alpha = 0.00393	–200.0 to 300.0°C
	Cu25 at 0°C alpha = 0.00425	–200.0 to 300.0°C
	Cu53 at 0°C alpha = 0.00426035	–50.0 to 150.0°C
	Cu100 at 0°C alpha = 0.00425	–50.0 to 150.0°C
	Pt25(JPt100*1/4)	–200.0 to 550.0°C
	Cu10 GE (high resolution)	–200.0 to 300.0°C
	Cu10 L&N (high resolution)	–200.0 to 300.0°C
	Cu10 WEED (high resolution)	–200.0 to 300.0°C
	Cu10 BAILEY (high resolution)	–200.0 to 300.0°C
	Pt100 (noise resistance)	–200.0 to 600.0°C
	JPt100 (noise resistance)	–200.0 to 600.0°C

Measurement Interval, Integration Time, and Filter

The table below shows the available measurement intervals. The module is equipped with an integrating A/D converter. The selectable integration time varies depending on the measurement interval as shown in the table below. For details about the relationship between noise and integration time, see section 2.7, “Measures against Noise on the MX100 Data Acquisition Unit.” In addition, the type of noise rejection filter switches as shown in the table below.

Measurement Interval	Integration Time	Burnout Detection Cycle	Filter	Rejected Noise and Notes
100 ms	1.67 ms	1 s*	Rectangular	600 Hz and its integer multiples**
200 ms		Measurement interval		
500 ms	16.67 ms			60 Hz and its integer multiples
	20 ms			50 Hz and its integer multiples
	Auto			Automatically detects the power supply frequency and set 16.67 or 20 ms
1 s	36.67 ms		Trapezoidal	50 Hz and 60 Hz and their integer multiples
2 s	100 ms		Rectangular	10 Hz and its integer multiples
5 s	200 ms		Cos	Fc = 5-Hz low-pass filter
10, 20, 30, 60 s				

* When the measurement interval is 100 ms, burnout is detected in one channel per measurement interval. Therefore, if measurement is started in a burnout condition or after a burnout occurs, burnout cannot be detected for up to 10 measurements (approximately 1 second).

** Because the power supply frequency noise is not rejected, measured values may fluctuate particularly for temperature measurements using thermocouples. If this happens, make the measurement interval longer, or use the 4-CH High-Speed Universal Input Module.

Measurement Synchronization

The module is equipped with a single A/D converter, and measurement is made sequentially. Therefore, measurements of each channel are not synchronized.

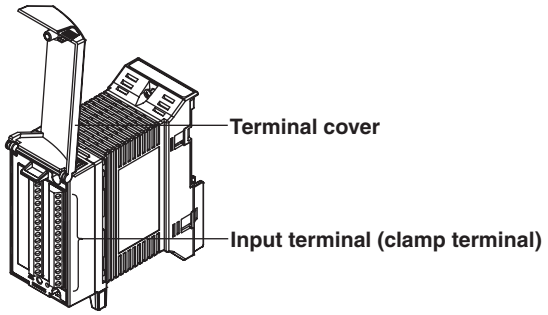
Common Mode Voltage

The common mode voltage between channels in a single module is 120 VACrms when the signal is applied continuously.

The common mode voltage between modules and between a module and earth is 600 VACrms when the signal is applied continuously.

1.5 Functions of the 10-CH, High-Speed Digital Input Module

This module is equipped with ten inputs and measures 5-V logic, non-voltage contact, and open collector inputs at a minimum measurement interval of 10 ms.



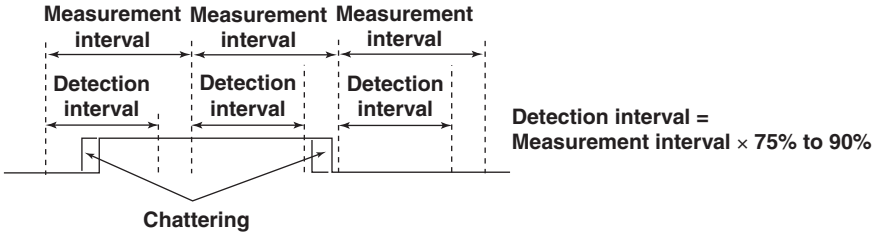
Measurement Interval

You can select the measurement interval from 10 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, and 60 s.

Filter

The module detects ON/OFF as shown below to prevent receiving chattering effects. If the measurement interval is set a value greater than four times the chattering period, measurement is possible by avoiding chattering effects.

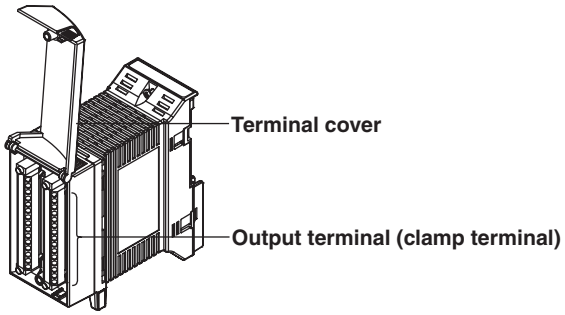
- Measurement interval of 5 s or less: Use the wider of the ON/OFF width of the detection period (approximately 75% to 90% of the measurement interval)



- Measurement interval of 5 s or more: Use the wider of the ON/OFF width of approximately 4.5 s

1.6 Functions of the 10-CH, Medium-Speed Digital Output Module

This module outputs 10 contact signals based on the alarm output settings and output settings on the PC software.



Output Type

The following types (output causes) are available.

Type	Description	Relay Action	Output Hold Behavior
Alarm	Alarm output of measurement channels	Energize or deenergize selectable	Hold** or non-hold selectable
Command	Alarm output of computation channels or manual DO operation	Energize or deenergize selectable	
Error	Output when an error* is detected in the MX100	Energize or deenergize selectable	Hold** or non-hold selectable
Fail	When a failure occurs in the CPU of the MX100 main module	Normal: Energized Failure: Deenergized	

* Below are the errors that can occur in the MX100.
- A data output request timeout (60 s) occurs while recording data.
- An input module detected at power-on that is able to make measurements is removed.
- A module breaks down.
- An unidentifiable module is attached.

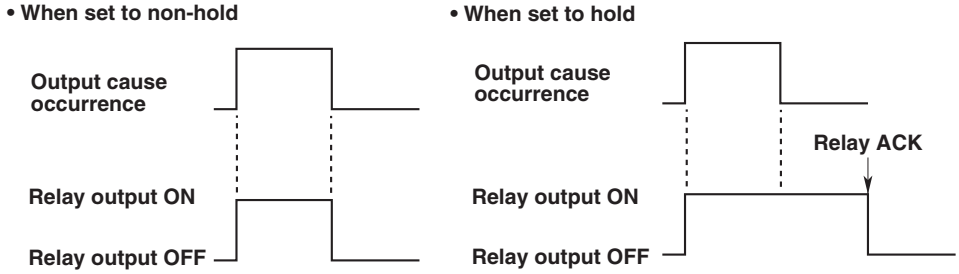
**Holds the output until the PC software issues the output release command (relay ACK).

Output Update Interval

The output is updated at 100-ms intervals. It is not synchronized to the measurement interval.

Relay Action and Hold Behavior

You can select whether to energize or de-energize the output relay when outputting contact signals on the PC software. You can also select whether the output relay is turned OFF (non-hold) or kept ON (hold) until an output release command is received.



2.1 Handling Precautions

This section describes the precautions to be taken when using the MX100. Read this section before use.

- If you are using this instrument for the first time, make sure to thoroughly read the safety precautions given on pages ii and iii.
- Do not remove the case.
  For internal inspection or adjustment, contact your nearest YOKOGAWA dealer as listed on the back cover of this manual.
- Do not place objects on top of the instrument.
  Never place other instruments or objects containing water on top of the instrument, otherwise a breakdown may occur.
- When carrying the instrument
  First, turn off the DUT and the MX100 and remove all cables including measurement wires and communication cables. Then, remove the power cord from the outlet.
- To prevent internal overheating, do not obstruct the vent holes of the module.
- This instrument uses many plastic parts. When cleaning, wipe using a dry soft cloth. Do not use volatile chemicals since this might cause discoloring and deformation.
- Do not bring charged objects near the signal terminals. Doing so can lead to malfunction.
- Do not pour volatile agents on the MX100 or leave it in contact with rubber or PVC products for an extended time. Doing so can lead to malfunction.
- Do not apply shock to the instrument.
- When not in use, make sure to turn OFF the power.
- If there are any symptoms of trouble such as smoke, strange orders, or strange sounds coming from the instrument, immediately turn OFF the power and stop power supply. Then, contact your nearest YOKOGAWA dealer.
- Do not damage the power cord
  Nothing should be placed on top of the power cord. The power cord should also be kept away from any heat sources. When unplugging the power cord from the outlet, never pull by the cord itself. Always hold and pull by the plug. If the cord is damaged, contact your dealer for replacement. Refer to page v for the part number of the appropriate power cord when placing an order.

2.2 Installation

Installation Location

Install the instrument indoors in the following locations.

- **Location where the temperature is between 0 to 50 °C.**
  Location where the relative humidity is between 20 and 80% RH for 0 to 40 °C and 10 and 50% RH for 40 to 50 °C. No condensation should be present.

Note

Condensation may occur if the instrument is moved to another place where the ambient temperature is higher, or if the temperature changes rapidly. In addition, measurement errors will occur when using thermocouple input. In this case, let the instrument adjust to the new environment for at least an hour before using the instrument.

- **Location where the operating altitude is 2,000 m or less**
- **Well-ventilated location**
  Install the instrument in a well-ventilated location to prevent the temperature inside the instrument from rising.
- **Location where mechanical vibration is small**
  Select a location with small mechanical vibration for installation.
- **Horizontal location**
  Install the instrument on a flat, even surface.

Do not install the instrument in the following places.

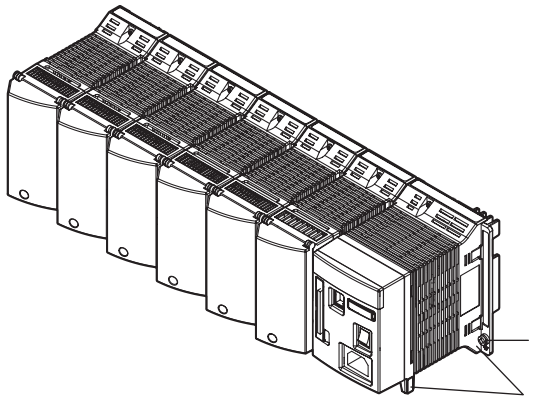
- **Dangerous locations where flammable liquids, vapors, or dust is present**
- **In direct sunlight or near heat appliances**
  Select a location with the smallest temperature fluctuation as possible near room temperature (23°C). Placing the instrument in direct sunlight or near heat appliances can cause adverse effects.
- **Where an excessive amount of soot, steam, humidity, dust, or corrosive gas is present**
  Soot, steam, humidity, dust, and corrosive gas can cause adverse effects on the instrument. Avoid installing the instrument in an environment with a high level of such elements.
- **Near magnetic field sources**
  Install the instrument in a location where the magnetic field is 400 A/m or less. Avoid bringing instruments that produce magnetic fields or magnets near the instrument. Using the instrument near a strong magnetic field source can cause measurement errors.

Installation Procedure

The MX100 Data Acquisition Unit can be used on a desktop, on a floor, in a rack mount, or in a panel mount. In all cases, be sure to install the instrument in a vertical position.

Use on a Desktop or a Floor

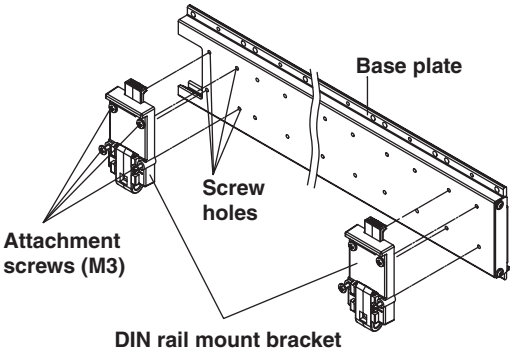
Each module has feet that can be attached to the base plate allowing them to be placed vertically. For the procedure for attaching the modules, see the next page.



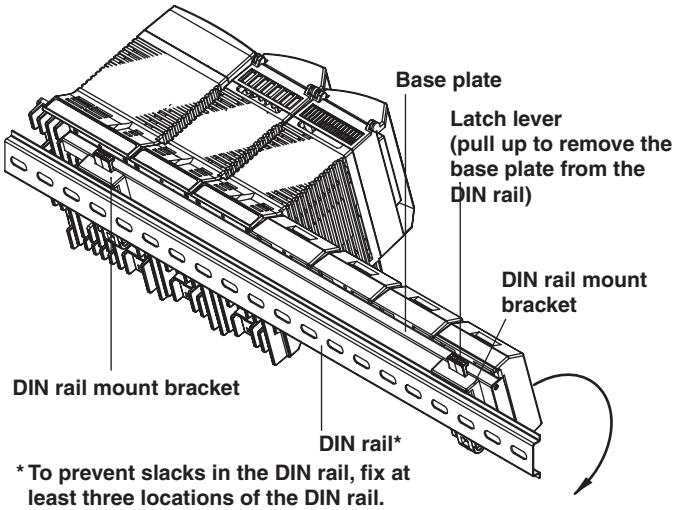
Attachment to a DIN Rail

As shown in the figure below, you can rack-mount or panel-mount the MX100 Data Acquisition Unit by attaching a DIN rail mount bracket to the base plate.

• Attachment of the DIN rail mount bracket to the base plate

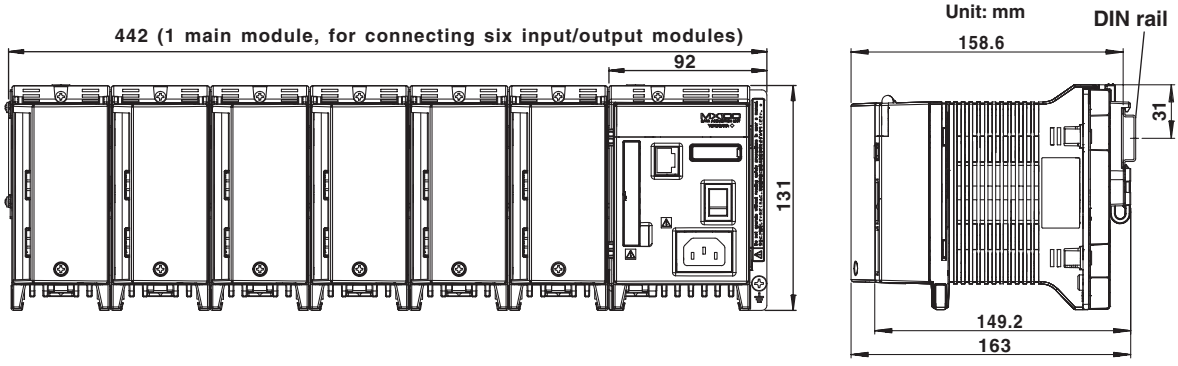


• Attachment of the base plate to the DIN rail


Base plate
Latch lever (pull up to remove the base plate from the DIN rail)
DIN rail mount bracket
DIN rail mount bracket
DIN rail*

* To prevent slacks in the DIN rail, fix at least three locations of the DIN rail.

• Dimensions when mounted on a DIN rail



2.3 Attaching the Modules

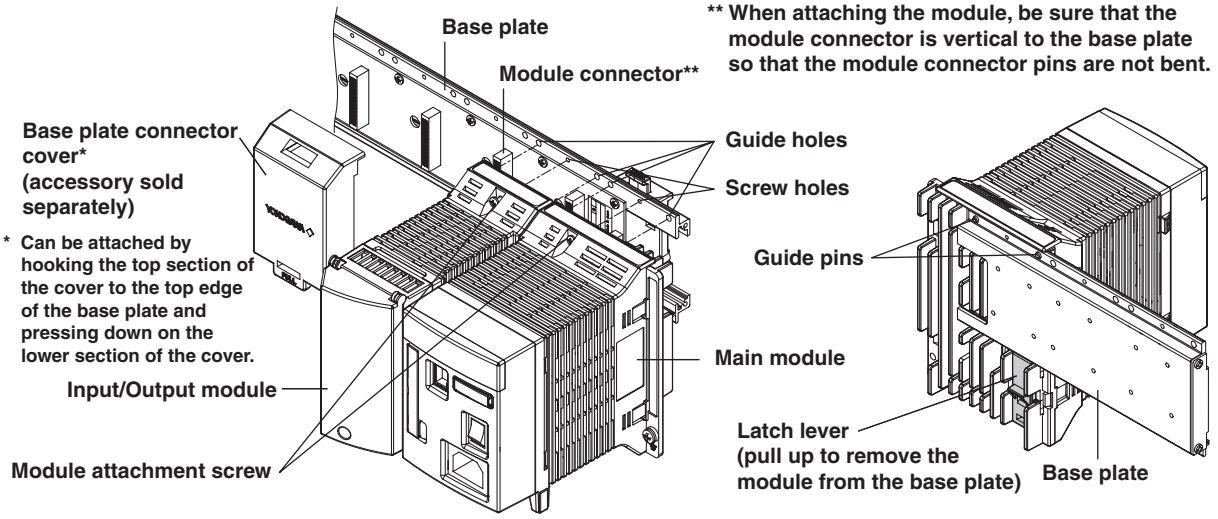
WARNING

To prevent electric shock and instrument breakdown, do not connect the power supply to the main module when attaching modules.

Attachment Procedure

1. Check that the power supply is not connected to the main module.
2. Align the connector on the rear panel of the module to the connector at the desired position of the base plate and insert the connector.
   When the connectors are correctly connected, the guide pin on the rear panel of the module is inserted into the guide hole on the base plate. In addition, the module is secured to the base plate with the latch lever locking in place at the bottom section of the base plate.
3. Fasten the attachment screw (M3) at one location at the top of the module.

To remove the module, loosen the attachment screw, pull down on the latch lever on the rear panel of the module, and pull the module straight from the base plate.

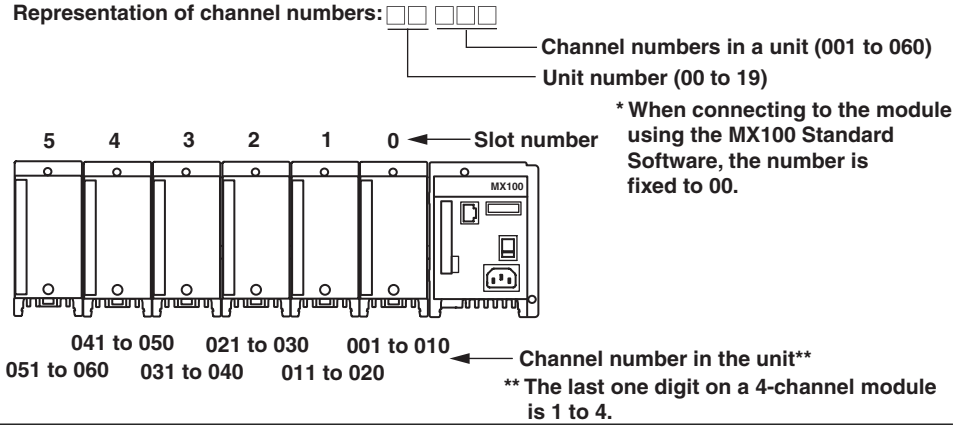

Base plate
Module connector**
** When attaching the module, be sure that the module connector is vertical to the base plate so that the module connector pins are not bent.
Base plate connector cover* (accessory sold separately)
* Can be attached by hooking the top section of the cover to the top edge of the base plate and pressing down on the lower section of the cover.
Guide holes
Screw holes
Guide pins
Main module
Input/Output module
Module attachment screw
Latch lever (pull up to remove the module from the base plate)
Base plate

Note

The main module can only be attached to the right end of the base plate.

Attachment Positions and Channel Numbers

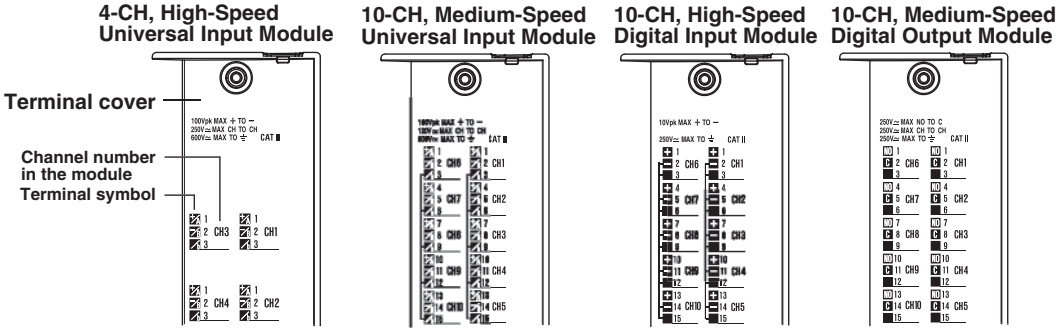
The figure below shows how the channel numbers are identified on the PC.


Representation of channel numbers: □□ □□□
Channel numbers in a unit (001 to 060)
Unit number (00 to 19)
* When connecting to the module using the MX100 Standard Software, the number is fixed to 00.
5 4 3 2 1 0
Slot number
MX100
041 to 050
051 to 060
021 to 030
031 to 040
001 to 010
011 to 020
Channel number in the unit**
** The last one digit on a 4-channel module is 1 to 4.

2.4 Connecting the Signal Wires

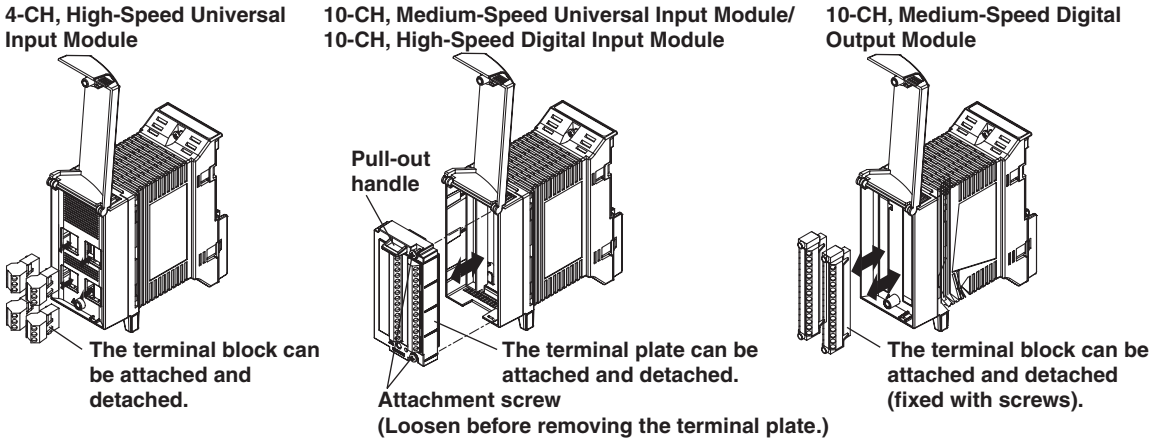
Terminal Arrangement Markings on the Terminal Cover

A character indicating the terminal function and a terminal symbol indicating the type of signal to be input/output to each terminal are written on the back of the terminal cover of each I/O module. For the wiring procedure corresponding to each terminal symbol, see page 2-7.


4-CH, High-Speed Universal Input Module
10-CH, Medium-Speed Universal Input Module
10-CH, High-Speed Digital Input Module
10-CH, Medium-Speed Digital Output Module
Terminal cover
Channel number in the module
Terminal symbol

Attaching and Removing the Terminal Block

The I/O terminals can be removed as shown in the figure below.

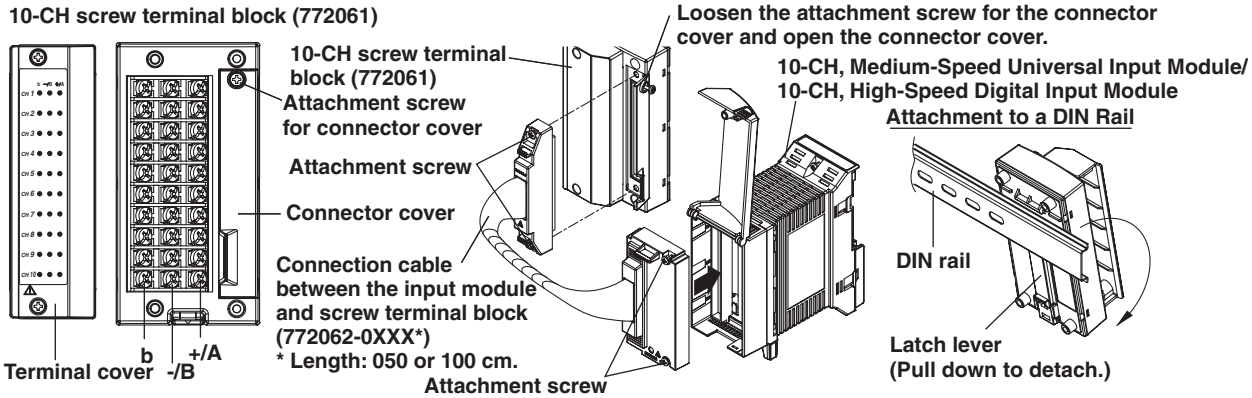

4-CH, High-Speed Universal Input Module
10-CH, Medium-Speed Universal Input Module/ 10-CH, High-Speed Digital Input Module
10-CH, Medium-Speed Digital Output Module
Pull-out handle
The terminal block can be attached and detached.
The terminal plate can be attached and detached.
Attachment screw (Loosen before removing the terminal plate.)
The terminal block can be attached and detached (fixed with screws).

Note

The terminal cover can be removed by pressing backward with the cover lifted up.

Screw Terminal Block

The 10-CH, Medium-Speed Universal Input modules and 10-CH, High-Speed Digital Input modules allow you to remove the terminal plate and connect a 10-channel screw terminal block (accessory sold separately, M4 screws) that can be attached to a DIN rail (see the figure below).


10-CH screw terminal block (772061)
Loosen the attachment screw for the connector cover and open the connector cover.
10-CH screw terminal block (772061)
Attachment screw for connector cover
Attachment screw
Connector cover
Connection cable between the input module and screw terminal block (772062-0XXX*)
* Length: 050 or 100 cm.
Terminal cover
b
-/B
+/A
Attachment screw
10-CH, Medium-Speed Universal Input Module/ 10-CH, High-Speed Digital Input Module
Attachment to a DIN Rail
DIN rail
Latch lever (Pull down to detach.)

General Precautions When Wiring the Input/Output Signal Wires

WARNING

- To prevent the possibility of electric shock when wiring, confirm that the power supply source and signal source are turned OFF. After making the connections, secure the terminal cover and do not touch the terminals with your hands.
- For signal wires on which voltage exceeding 30 VAC/60 VDC is applied relative to the ground potential or between signals, use reinforced (double) insulation wires. For all other signal wires, use basic insulation wires. For the withstand voltage of insulation wires, see the table below.

Applied Voltage (Vrms or VDC)	Basic Insulation	Reinforced (Double) Insulation
30 (60 VDC) to 100	490 Vrms	740 Vrms
101 to 150	820 Vrms	1400 Vrms
151 to 300	1350 Vrms	2300 Vrms
301 to 600	2200 Vrms	3700 Vrms

- If you remove the terminal block or terminal plate for wiring, attach the terminal bock or terminal plate before inputting or outputting signals to prevent electric shock or fire.

CAUTION

- If a large pulling force is applied to the input/output signal wires connected to the MX100, the terminal or signal wire may break. To prevent this from happening, fix all the wiring cables to the installation panel.
- Do not apply a voltage exceeding the value indicated below to the input terminals of the universal input modules. Doing so can damage the modules.
  - Maximum input voltage
    Voltage range less than or equal to 1 VDC, TC, RTD, and DI: ±10 VDC
    Other voltage ranges: ±120 VDC
  - Maximum common mode voltage: 600 VACrms (50/60 Hz)
- Do not apply a voltage exceeding the value indicated below to the input terminals of the 10-CH, High-Speed Digital Input module or the output terminals of the 10-CH, Medium-Speed Digital Output module. Doing so can damage the modules.
  - Maximum input voltage
    10-CH, High-Speed Digital Input module: ±10 VDC
    10-CH, Medium-Speed Digital Output module: 250 VAC or 250 VDC
  - Maximum common mode voltage: 250 VACrms (50/60 Hz)
- The MX100 is a product of installation category II.

Consider the points indicated below to prevent noise from entering the measurement circuit. For a description of the measures against noise on the MX100, see section 2.7.

- Keep the measurement circuit away from the power supply cable (power supply circuit) and ground circuit.
- It is desirable that the object under measurement is not a noise source. However, if this is not avoidable, insulate the object under measurement and the measurement circuit. In addition, ground the object under measurement.
- Shielded wires are effective against noise caused by electrostatic induction. As necessary, connect the shield to the ground terminal of the MX100 (make sure this does not lead to grounding at two points).
- Twisting the measurement circuit wires at short intervals is relatively effective against noise caused by electromagnetic induction.
- Make sure to ground the protective ground terminal through a small grounding resistance (less than or equal to 100 Ω).

When using the reference junction compensation of the MX100 through thermocouple input, take measures to stabilize the temperature at the terminal section.

- Always close and secure the terminal cover.
- Do not use thick wires with high heat radiation effect (cross-sectional area of 0.5 mm^2 or smaller recommended).
- Keep the ambient temperature consistent. Large temperature fluctuation occurs such as when a fan nearby is turned ON/OFF.

Connecting the input wires in parallel with other instruments may mutually affect the measured values.

If you need to make a parallel connection:

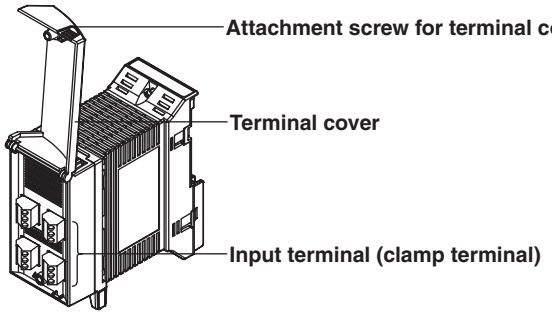
- Turn OFF burnout.
- Ground each instrument at a single common point.
- Do not turn ON/OFF the instrument while measurement is in progress. It may cause adverse affects on the other instrument.

Note that RTDs cannot be connected in parallel.

Wiring Procedure

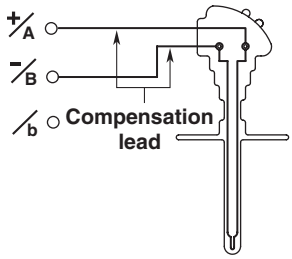
1. Turn OFF the power to the MX100.
2. Loosen the terminal cover attachment screw and lift up the terminal cover.
3. Connect the signal wires to the terminals.
4. Return the terminal cover to the original position and secure it with the screw.

4-CH, High-Speed Universal Input Module

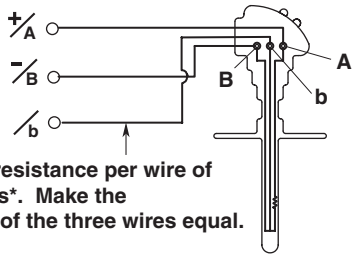


Wiring the Universal Input Module

• Thermocouple input



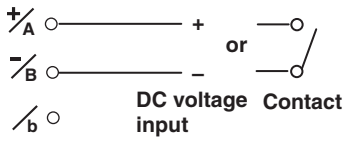
• RTD input



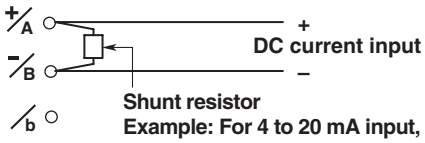
Lead wire resistance per wire of 10 Ω or less*. Make the resistance of the three wires equal.

*** In the case of Pt100Ω. 5 Ω max for Pt50Ω. 1 Ω max. for Cu10 Ω.**

• DC voltage input/DI input (contact)



• DC current input

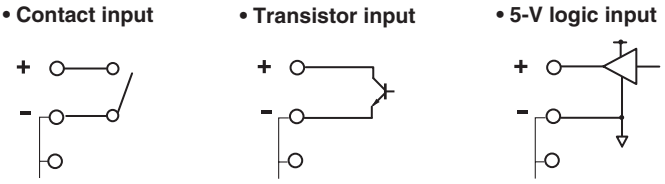


Example: For 4 to 20 mA input, shut resistance values should be 250 Ω±0.1%.

Note

On the 10-CH, Medium-Speed Universal Input module, RTD input terminals A and B are isolated on each channel. Terminal b is shorted internally across all channels.

Wiring the Digital Input Module



Main Input Specifications

Input type:	Non-voltage contact, open collector, and 5-V logic
Input format:	Pull-up at approximately 5 V/approximately 5 kΩ, common electric potential between channels
Minimum detection pulse width:	Twice the measurement interval or more
Input threshold level:	Non-voltage contact, open collector: ON at 100 Ω or less and OFF at 100 kΩ or greater 5-V logic: OFF at 1 V or less and ON at 3 V or greater
Contact/Transistor rating:	Contact with a rating of 15 VDC or greater and 30 mA or greater Transistor with a rating of Vce > 15 Vdc and Ic > 30 mA
Terminal type:	Clamp
Applicable wire size:	0.14 to 1.5 mm^2 (AWG26 to 16)

Note

On the digital input module, the negative terminals and empty terminals of all channels are shorted internally.

Wiring the Digital Output Module

Main Output Specifications

Contact mode:	A contact (SPST)
Contact capacity:	250 VDC/0.1 A, 250 VAC/2 A, or 30 VDC/2 A (resistance load)
Terminal type:	Clamp, attached and removed in units of 5 channels
Applicable wire size:	0.08 to 2.5 mm^2 (AWG28 to 12)

Note

Do not connect anything to the empty terminals of the digital output module.

2.5 Power Connection and ON/OFF

WARNING

- To prevent the possibility of electric shock when wiring, confirm that the power supply source is turned OFF.
- To prevent an electric shock or fire, use only power cords supplied by YOKOGAWA for the MX100 Data Acquisition Unit.
- Make sure to perform protective earth grounding to prevent electric shock. Connect the power cord for the MX100 Data Acquisition Unit to a three-prong power outlet with a protective earth terminal.
  Do not use the functional ground terminal (see page 2-3) as a protective earth terminal.
- Do not use an extension cord without protective earth ground. Otherwise, the protection function will be compromised.

Use a power supply that meets the conditions indicated below.

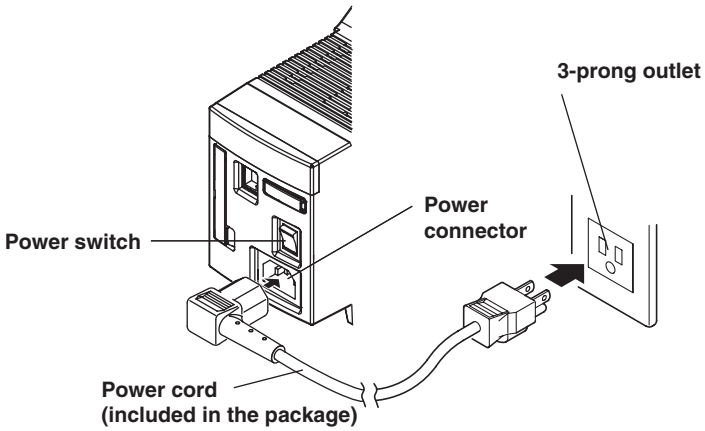
Item	Specification
Rated supply voltage	100 to 240 VAC
Supply voltage range used	90 to 132/180 to 264 VAC
Rated supply voltage frequency	50/60 Hz
Allowable line frequency range	50/60 Hz ± 2%
Maximum power consumption	Approximately 70 VA maximum when six modules are installed

Note

Do not use a supply voltage in the range 132 to 180 VAC, as this may have adverse effects on the measurement accuracy.

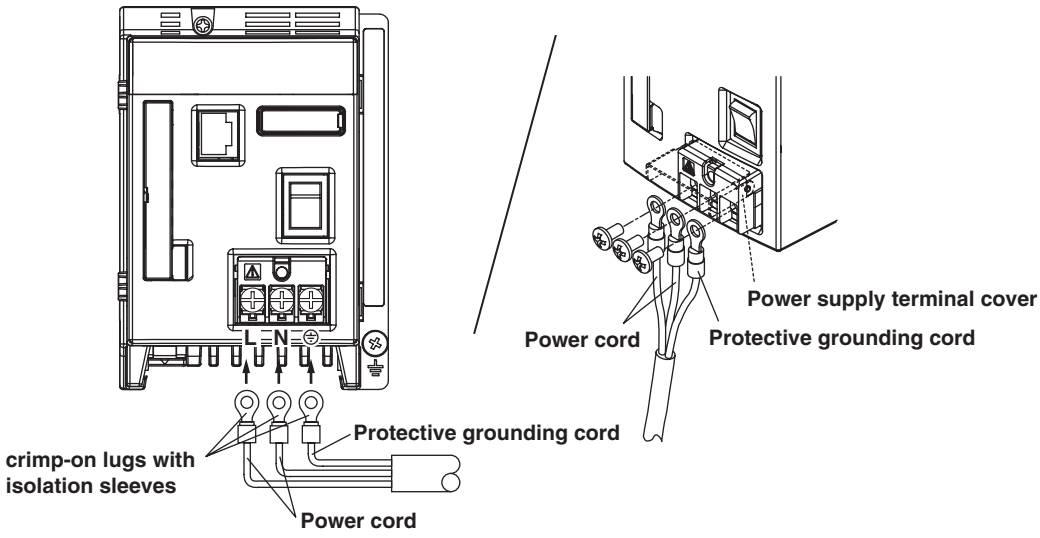
Connection Procedure Using the Power Cord (When the Suffix Code of the Power Supply and Power Cord Is D)

1. Check that the power switch of the main module is OFF.
2. Connect the power cord plug to the power connector of the MX100 Data Acquisition Unit. (Use the power cord that came with the package.)
3. Connect the plug on the other end of the power cord to the outlet that meets the conditions above. The AC outlet must be of a three-prong type with a protective earth ground terminal.



Wiring Procedure to the Power Supply Terminal (When the Suffix Code of the Power Supply and Power Cord Is W)

1. Check that the power supply and the power switch of the main module is OFF.
2. Loosen the screw fixing the power supply terminal cover of the main module in place and open the power supply terminal cover.
3. Connect the power cord and the protective ground cord to the power supply terminals according to the figure below.
   Use round crimp-on lugs with isolation sleeves (for 4 mm screws) for the power cord and protective ground cord terminals.
4. Close the power supply terminal cover and secure it with the screw.



Turning ON/OFF the Power Switch

Pressing the I side of the power switch turns the instrument ON. Pressing the O side turns the instrument OFF.

When turned ON, the 7-segment LED (see page 1-7) illuminates. When the instrument is ready (after completing the self-test), the unit number is displayed. When using the MX100 Standard Software, the unit number is fixed to 00 (displayed as 00).

Note

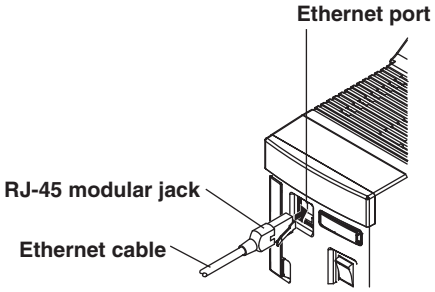
- Before turning the power ON, check that the modules are attached correctly and that the power cord is connected correctly.
- If the 7-segment LED does not illuminate when the power switch is turned ON, turn OFF the power switch and check the following points. If the condition does not change when the power switch is turned ON after checking these points, it is probably a malfunction. Contact your nearest YOKOGAWA dealer for repairs.
  - That the power cord is plugged in properly.
  - That the supply voltage is within the supply voltage range used given on the previous page.
- If the 7-segment LED displays something other than a unit number when the power switch is turned ON, see section 3.1, “Error Display on the 7-Segment LED and Corrective Actions” and carry out the specified corrective action. If the displayed information does not change even when you carry out the corrective action, it is probably a malfunction. Contact your nearest YOKOGAWA dealer for repairs.

2.6 Connecting the Ethernet Cable

Connection Procedure

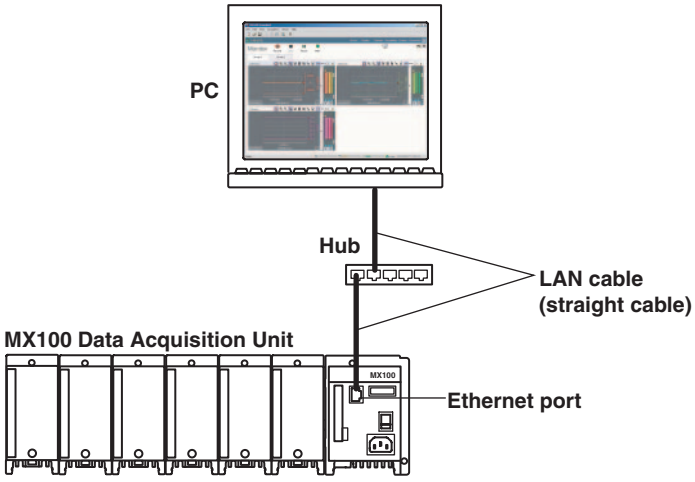
Connector

Connect the Ethernet cable to the Ethernet port (10BASE-T/100BASE-TX) of the main module. Use a UTP cable (category 5 or better) or an STP cable for the Ethernet cable.



Connection to the PC

Make the connection via a hub. For a one-to-one connection with a PC, make the connection as shown in the figure below. Likewise, up to 20 MX100 Data Acquisition Units can be connected to a single PC. However, to control multiple MX100 Data Acquisition Units, you need MXLOGGER (software sold separately). You cannot control multiple units using the MX Standard Software.

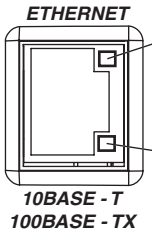


Note

- The NIC on the PC should support 100BASE-TX (recommended) or 10BASE-T.
- When connected to an external network, the communications within the network other than those related to the MX100 may hinder the measurement operations on the MX100.
- The MX100 can be connected to an auto-negotiating hub (between 10BASE-T and 100BASE-TX), but connection may fail on some hubs due to the hub not recognizing the signal output from the MX100. If this happens, you can turn only dip switch 6 of the main module OFF to fix the data rate to 10 Mbps. Operate the dipswitch only when the power is turned OFF.

Checking the Communication Status

You can check the status on the two LEDs at the upper-right and lower-right of the Ethernet port.



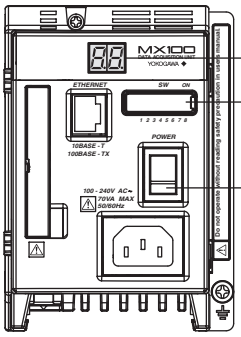
LINK LED
Illuminates in orange when the link between the MX100 and the connected device is established and communication is mutually possible.

ACT LED
Illuminates in green when transmitting/receiving packets.

Initializing the Settings

The dipswitch on the main module is used to initialize the settings including the IP address assigned to the MX100.

1. Turn OFF the power to the MX100.
2. Turn dipswitch 5 of the main module OFF.
3. Turn ON the power to the MX100.
   The 7-segment LED indicates the self-test operation at power up (see page 1-7), and then displays bF.
4. Check the status of step 3, then turn the power OFF.
5. Turn dipswitch 5 back ON.
   Check that the settings have been initialized (using the MX100 Standard Software, for example).



7-segment LED

Dipswitches

Remove the cover when manipulating the dipswitches.

Power switch

• Normal setting

• Turn switch 5 OFF

2.7 Measures against Noise on the MX100 Data Acquisition Unit

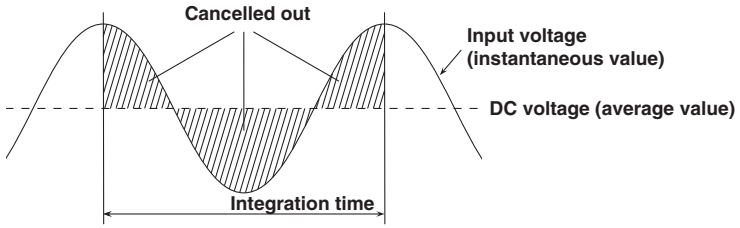
Technical Information described below is available as reference material on measures against noise.

- Noise Interference on Recorder (TI 4D5B1-80E)
  Describes the fundamentals concerning noise and its countermeasures in two parts: basic edition and application edition.
- MX100 Performance Specifications (TI 04M08B01-00E)
  Describes in detail the functions related to noise rejection specific to the MX100 Data Acquisition Unit.

This section briefly describes the integrating A/D converter and the first-order lag filter that the MX100 Data Acquisition Unit employs as measures against noise.

Integrating A/D Converter

MX100 input modules employ integrating A/D converter for converting the measured analog signals into digital signals. The integrating A/D converter integrates the measured values at the specified time width. If the specified time spacing matches the period of the signal you wish to reject, the signal is rejected.



For example, if the integration time is 20 ms, signals having frequencies of 50 Hz and integer multiples of 50 Hz can be rejected. Likewise, if the integration time is 16.67 ms, signals having frequencies of 60 Hz and integer multiples of 60 Hz can be rejected. If the integration time is 100 ms, signals having 10 Hz and integer multiples of 10 Hz can be rejected. The commercial power supply is one of the noise sources. By setting these integration times, commercial power noise of 50 Hz or 60 Hz can be eliminated.
The table below shows the integration times assigned to the MX100.

4-CH, High-Speed Universal Input Module

Measurement Interval	Integration Time	Rejected Frequencies and Notes
10 ms	1.67 ms	600 Hz and its integer multiples, temperature measurement not possible
50 ms	16.67 ms	60 Hz and its integer multiples
	20 ms	50 Hz and its integer multiples
	Auto	Automatically detects the power supply frequency and set 16.67 or 20 ms
100 ms	36.67 ms	50 Hz and 60 Hz and their integer multiples
200 ms		
500 ms	100 ms	10 Hz and its integer multiples
1 s	200 ms	Low-pass filter with Fc = 5 Hz
2, 5,10, 20, 30, 60 s		

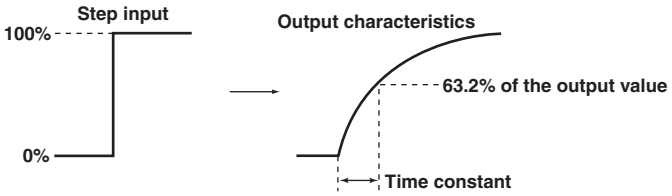
10-CH, Middle-Speed Universal Input Module

Measurement Interval	Integration Time	Rejected Frequencies and Notes
100 ms	1.67 ms	600 Hz and its integer multiples*
200 ms		
500 ms	16.67 ms	60 Hz and its integer multiples
	20 ms	50 Hz and its integer multiples
	Auto	Automatically detects the power supply frequency and set 16.6 or 20 ms
1 s	36.67 ms	50 Hz and 60 Hz and their integer multiples
2 s	100 ms	10 Hz and its integer multiples
5 s	200 ms	Low-pass filter with Fc = 5 Hz
10, 20, 30, 60 s		

* Because the power supply frequency noise is not rejected, measured values may fluctuate particularly for temperature measurements using thermocouples. If this happens, make the measurement interval longer, or use the 4-CH High-Speed Universal Input Module.

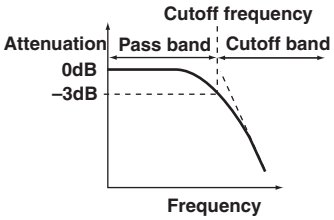
First-Order Lag Filter

For noise sources other than power supply noise, the MX100 Data Acquisition Unit is equipped with a first-order lag filter having output characteristics indicated in the figure below against step input. The time constant of the first-order lag filter can be selected on the PC software (MX100 Standard Software, MXLOGGER (sold separately), or the API for the MX100/DARWIN (sold separately)).



Measurement Interval (s)	Selectable Time Constants (s)						
	n=5	n=10	n=20	n=25	n=40	n=50	n=100
0.01	0.05	0.1	0.2	0.25	0.4	0.5	1
0.05	0.25	0.5	1	1.25	2	2.5	5
0.1	0.5	1	2	2.5	4	5	10
0.2	1	2	4	5	8	10	20
0.5	2.5	5	10	12.5	20	25	50
1	5	10	20	25	40	50	100
2	10	20	40	50	80	100	200
5	25	50	100	125	200	250	500
10	50	100	200	250	400	500	1000
20	100	200	400	500	800	1000	2000
30	150	300	600	750	1200	1500	3000
60	300	600	1200	1500	2400	3000	6000

If the first-order lag filter is applied to the input signal, low-pass filter frequency characteristics shown in the figure below are attained.



If the time constant of the first-order lag filter is set long, the cutoff frequency is lowered, and frequency bandwidth that can be rejected is widened. Set an appropriate time constant according to the frequency of the noise you wish to reject.

2.8 Handling of the CF Card

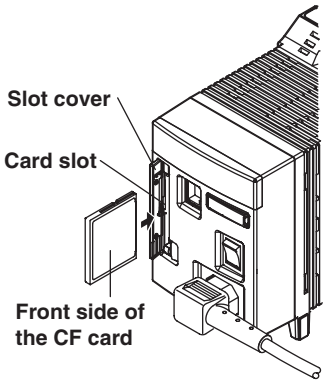
Handling Precautions of the CF Card

Note the following points when using the CF card. For the general handling precautions of the CF card, see the instruction manual that came with the CF card.

- The CF card is a precision electronic device. Do not use or store the CF card in an environment with strong static electricity or environment where electric noise tends to appear.
- Do not remove the CF card from the card slot while data is being written. Doing so can damage or erase the data.

Inserting the CF Card

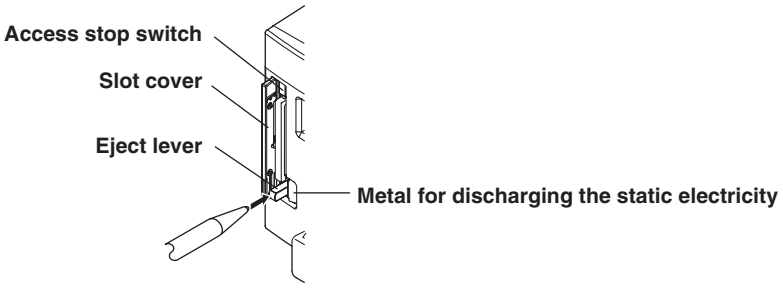
To insert the CF card into the card slot, open the slot cover and face the card's front side to the right.



Ejecting the CF Card

Be sure to check that the CF card is not being access before ejecting the card from the slot. When the CF card is being accessed, the 7-segment LED indicates this fact (see page 1-8).

To eject the CF card, open the slot cover while touching the metal for discharging the static electricity, and press the eject lever once. Then, press the eject lever that came out once again, and remove the CF card from the slot.

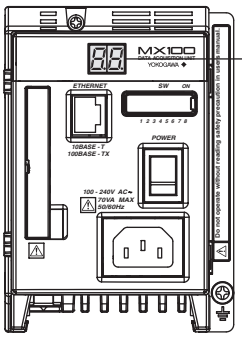


Note

- If it is difficult to press the eject lever with your finger, use an object with a narrow tip such as a pen as shown in the figure above.
- Do not close the slot cover by force when the eject lever is out. Doing so can damage the CF card slot. When not using the eject lever, push the lever in so that the slot cover can be closed.
- If you need to eject the CF card while it is being accessed (when the operation mode is backup), open the slot cover, and press the access stop switch (see the figure above) at the top section of the slot. After the data save operation to the CF card stops (the operation mode on the 7-segment LED described on page 1-7 changes from backup to measurement), eject the CF card.

3.1 Error Display on the 7-Segment LED and Corrective Actions

The main module has a two-digit 7-segment LED as shown in the figure below. The 7-segment LED displays the system status. This section describes the displays on the 7-segment LED when errors occur on the system and their corrective actions. For normal displays other than errors, see pages 1-7 and 1-8.



If servicing is necessary, or if the instrument is not operating correctly after performing the corrective actions below, contact your nearest YOKOGAWA dealer.

Errors at Power ON

The left and right digits of the 7-segment LED display “b” and an error code, respectively. The LED illuminates.

Probable Cause	Corrective Action	Reference Page
The display is b* (where * is any character other than F) The dipswitch settings are not correct.	Turn OFF the power, remove the CF card, turn ON all dipswitches, and power up again. If the situation does not change, servicing is required.	2-15
The display is bF. The dipswitch settings are not correct.	Powering up in setup reset mode. Turn OFF the power, turn ON all dipswitches, and power up again. Since all settings such as the IP address are initialized, reconfiguration is necessary.	2-12

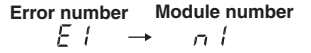
System Errors

The left and right digits of the 7-segment LED display “F” and an error code, respectively. The LED illuminates.

Display	Probable Cause	Corrective Action	Reference Page
F0	System ROM error.	Servicing required.	–
F1	SRAM error.	Servicing required.	–
F2	EEPROM error.	Servicing required.	–
F3	Error in the internal battery of the main module.	Servicing required. However, this error is also displayed immediately after the battery is replaced. If this happens, power-cycle the MX100.	–
F4	Ethernet controller error.	Servicing required.	–

Module Errors

The left and right digits of the 7-segment LED display “E” and an error code, respectively. The LED illuminates.
In the case of module errors, the error number and the corresponding module number are displayed alternately as shown in the figure below.



Display	Probable Cause	Corrective Action	Reference Page
E0	Range information error.	Servicing required.	–
E1	Calibration value error.	Recalibrate the module. If the error occurs even after recalibrating, servicing is required.	*
E2	Calibration reference voltage is not correct. (during calibration)	Check whether the correct calibration reference voltage is being applied or whether the channel to which the voltage is applied is correct.	*
E3	Error in writing the calibration value.	Servicing required.	–
E4	The installed module cannot be used.	Replace the module with one that can be used.	–

* See the MX100 Standard Software User’s Manual.

Media-Related Errors.

The left and right digits of the 7-segment LED display “P” and an error code, respectively. The LED blinks. The error code is saved to the log file (see page 1-9).

Display	Probable Cause	Corrective Action	Reference Page
P0	Manipulated the CF card while it was being accessed.	Do not manipulate the CF card while it is being accessed.	2-15
P1	CF card error.	The CF card may not be formatted or may be damaged. Check the CF card.	–
P2	The CF card was not formatted correctly.	Insert the CF card into the CF card slot and format the card again, or replace with another CF card.	*
P3	Not enough free space on the CF card.	Delete unneeded data to increase the free space, or replace with another CF card.	*
P4	The number of files saved on the CF card exceeded 512.	Delete unneeded files to decrease the number of files, or replace with another CF card.	*
P5	Overwrite error in the data storage buffer	The time needed to store the file must be reduced. Delete unneeded files to secure more free space, or format the CF card. If you are using a software application through the MX100/ DARWIN API, the timeout setting may not be appropriate. If so, change the value to an appropriate value.	*

* See the MX100 Standard Software User’s Manual.

Communication Errors

The left and right digits of the 7-segment LED display “C” and an error code, respectively. The LED blinks.

Display	Probable Cause	Corrective Action	Reference Page
C1	Multiple connection error.	Disconnect the current connection and reconnect. However, this error may also appear when the Ethernet cable is removed and inserted again.	*

* See the MX100 Standard Software User’s Manual.

3.2 Troubleshooting

If servicing is necessary, or if the module is not operating correctly after performing the following corrective actions, contact your nearest YOKOGAWA dealer as listed on the back cover of this manual.

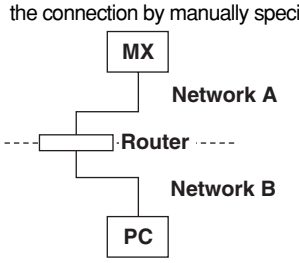
The 7-segment LED does not illuminate.

Probable Cause	Corrective Action	Reference Page
The power switch is not ON.	Turn ON the power switch.	2-9
The supply voltage is too low.	Check whether the voltage is within the supply voltage rating range.	2-9
The fuse is blown.	Servicing required.	–
The power supply is broken.	Servicing required.	–

The 7-segment LED repeats blinking.

Probable Cause	Corrective Action	Reference Page
The power supply is shorted inside the input/output module.	Remove the input/output module one bye one and determine the broken module. (Servicing required.)	–
The power supply is shorted inside the main module.	Replace the main module. (Servicing required.)	2-4

The MX100 cannot be detected from the PC or cannot be detected with the Search button.

Probable Cause	Corrective Action	Reference Page
The LINK LED does not turn ON. The cable is broken.	Replace the Ethernet cable.	2-12
The LINK LED does not turn ON. There is a problem with the hub.	Check the hub's power supply. If it still does not work, replace the hub and check the hub's operation. Also, try to connect the MX100 using the 10-Mbps fixed mode.	2-11, 2-12
The LINK LED does not turn ON. There is a problem with the PC.	Check whether the PC can connect to the network. Replace the PC's NIC.	2-12
The ACT LED does not turn ON. There is a problem in the connection between the hub and the MX100.	Check the hub's power supply. If it still does not work, replace the hub and check the hub's operation. Also, try to connect the MX100 using the 10-Mbps fixed mode.	2-11, 2-12
The ACT LED does not turn ON. There is a problem with the PC.	Check whether the PC can connect to the network. Replace the PC's NIC.	2-12
There is a problem in the network configuration. The settings are not correct.	Check that the IP address, subnet mask, and default gateway settings of the PC correspond to the MX100 settings.	*
There is a problem in the network configuration. The setting changes have not taken effect.	Turn OFF the power to the PC and the MX100, and carry out reconnection.	*
There is a problem in the software created using the MX100/DARWIN API.	Check whether the connection can be made using the MX100 Standard Software.	*
The PC and the MX100 are not in the same segment.	Connect the PC and the MX100 in the same network segment. If the PC and the MX100 are connected as shown in the following figure, the Search button cannot be used to detect the MX100. You can make the connection by manually specifying the IP address of the MX100. 	*

* See the MX100 Standard Software User's Manual.

The MX100 can be detected using the Search button, but connection fails.

Probable Cause	Corrective Action	Reference Page
The IP address is set to the default value. The default value cannot be used to make the connection.	Set the correct IP address.	*
There is a problem in the network configuration.	Check that the IP address, subnet mask, and default gateway settings of the PC and the MX100 settings are correct.	*

* See the MX100 Standard Software User's Manual.

The Calibratior cannot connect to the MX100.

Probable Cause	Corrective Action	Reference Page
Attempting to make multiple connections. Another software program such as the MX100 Standard Software is already connected.	Close all other software programs such as the MX100 Standard Software.	*

* See the MX100 Standard Software User's Manual.

The connected input/output module is not detected.

Probable Cause	Corrective Action	Reference Page
Module connection or module startup error. Attached the module while the power was ON.	Turn OFF the power. Detach the input/output module once and attach it again.	2-4, 2-9
Carried out an incorrect calibration.	Recalibrate.	*

* See the MX100 Standard Software User's Manual.

The measured value is not correct.

Probable Cause	Corrective Action	Reference Page
The input wiring is not correct.	Check the input wiring.	2-7
The measured value indicates +Over or –Over. The measurement range setting and input range do not match.	Change to an appropriate setting.	*
The temperature error is large or is unstable. The TC type setting and the type actually connected are different.	Change to the correct setting.	*
The temperature error is large or is unstable. The RJC setting is not correct.	Change to the correct setting.	*
The temperature error is large or is unstable. The wind is hitting the terminals.	Block the wind from hitting the terminals.	–
The temperature error is large or is unstable. The ambient temperature change is drastic.	Suppress changes in the ambient temperature such as by placing the MX100 in a box.	–
The temperature error is large or is unstable. There is an error in the wiring resistance (in the case of an RTD).	Match the thickness and length of the three wires.	2-7
The measurement error is large or is unstable. Noise effects.	Take measures against noise.	2-13
The measurement error is large or is unstable. Effects from the signal source resistance.	Reduce the signal source resistance such as by inserting a converter.	–
The temperature error is large or is unstable. Effects from parallel connections.	Stop parallel connections. Do not use the burnout setting.	–

* See the MX100 Standard Software User's Manual.

Alarms are not output.

Probable Cause	Corrective Action	Reference Page
There is a problem in the alarm setting. Both the alarm and output relay must be set.	Make the alarm and output relay settings appropriate.	*

* See the MX100 Standard Software User's Manual.

The CF card is not detected.

Probable Cause	Corrective Action	Reference Page
There is a problem with the CF card.	Replace the CF card. Eject and format the CF card. Then, insert it again.	2-15

3.3 Calibration

It is recommended that the MX100 be calibrated once a year to assure its measurement accuracy. A calibration instrument with an appropriate accuracy and resolution is required for calibrating the MX100. For information on purchasing the calibration instruments, contact your nearest YOKOGAWA dealer.
For details regarding calibration, contact your nearest YOKOGAWA dealer for details.

Calibration of the Measurement Range of the DC Voltage and RTD

Required Instruments

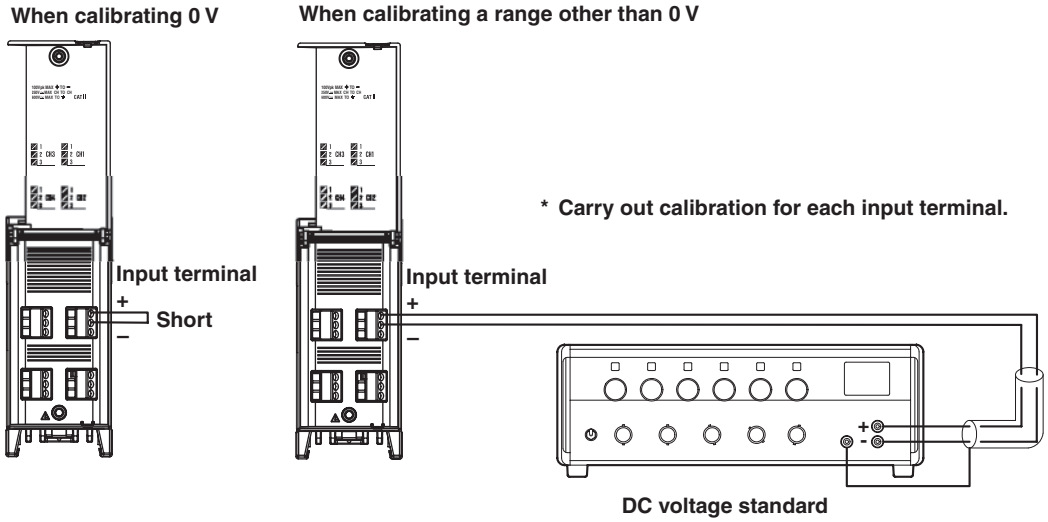
- DC voltage standard
  Must meet the following specifications (5520A by FLUKE or equivalent):
  Output range: 20 mV to 100 V
  Accuracy in the output range: ±(0.005% + 1 μV) or less
- Decade resistance box
  Must meet the following specifications (Model 2793-01 by Yokogawa M&C Corporation or equivalent)
  Resistance range: 0.1 to 500 Ω
  Accuracy in the resistance range: ±(0.01% + 2 mΩ)
  Resolution: 0.001 Ω

Calibration Procedure

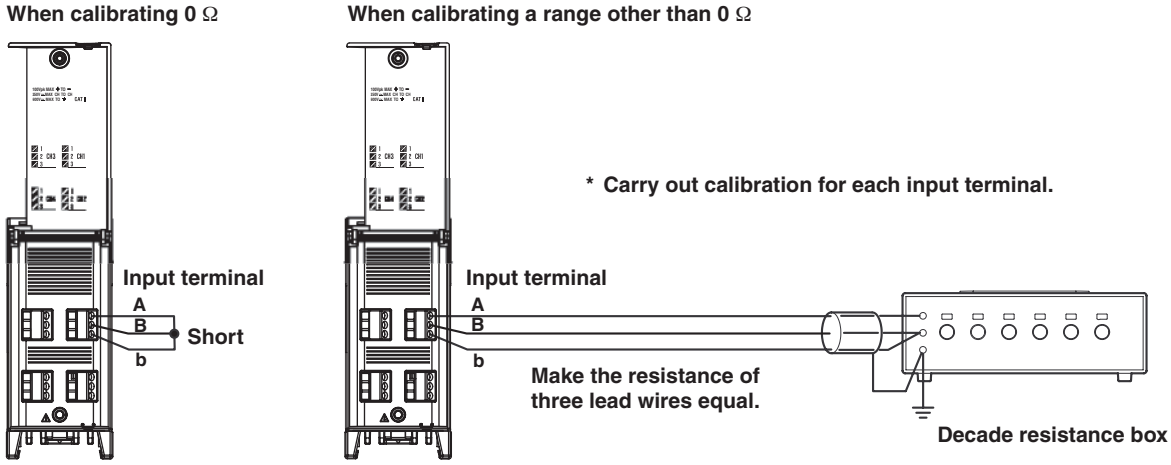
1. Wire the universal input module and the calibration instrument as shown in the figure below, and adequately warm up the MX100 Data Acquisition Units (the warm-up time of the MX100 Data Acquisition Unit is at least 30 minutes).
2. Check that the operating environment such as ambient temperature and humidity is within the standard operating conditions (see sections 4.4 and 4.5).
3. Connect the PC and the MX100 Data Acquisition Unit so that communication is possible. Start the Calibratior of the MX Standard Software, and then start the calibration.
   For the operating procedure of the Calibratior, see the MX Standard Software User's Manual (IM MX180-01E).

Wiring Diagram

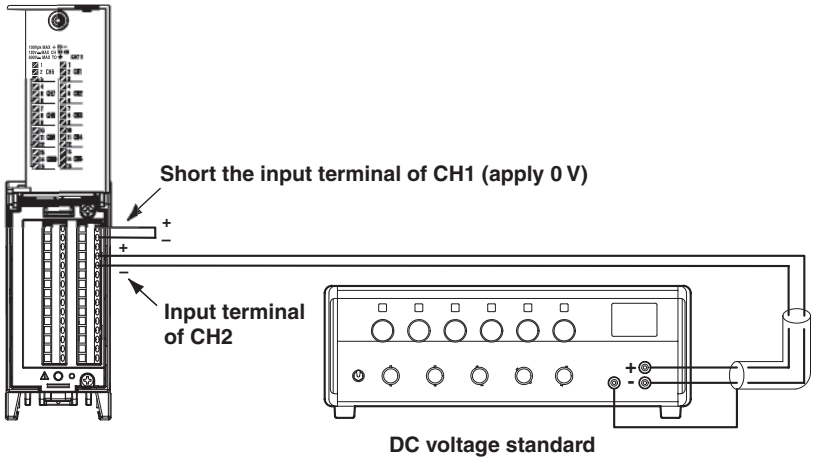
- When calibrating the DC voltage range of the 4-CH, High-Speed Universal Input module



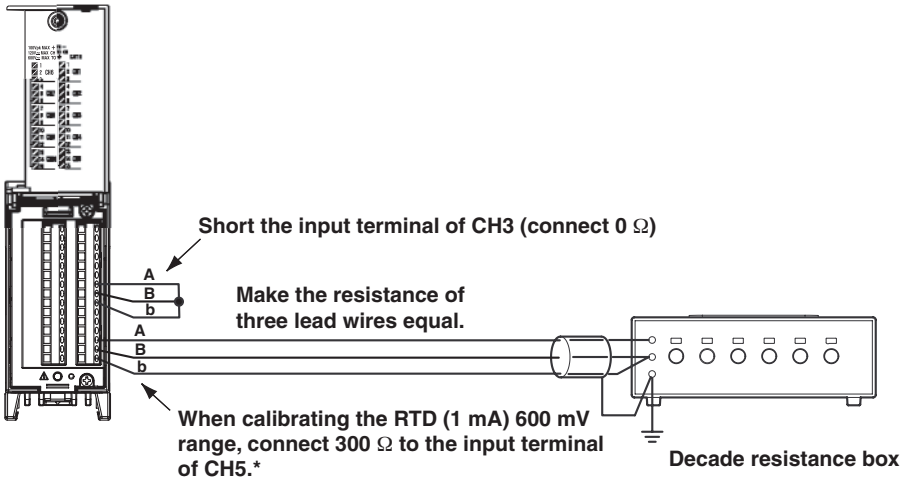
- When calibrating the RTD range of the 4-CH, High-Speed Universal Input module



- When calibrating the DC voltage range of the 10-CH, Medium-Speed Universal Input module



- When calibrating the RTD range of the 10-CH, Medium-Speed Universal Input module


Short the input terminal of CH3 (connect 0 Ω)
A
B
b
Make the resistance of three lead wires equal.
A
B
b
When calibrating the RTD (1 mA) 600 mV range, connect 300 Ω to the input terminal of CH5.*
Decade resistance box

*** When calibrating the RTD (1 mA) 60 mV range, connect 60 Ω to the input terminal of CH6. When calibrating the RTD (1 mA) 200 mV range, connect 200 Ω to the input terminal of CH4.**

Calibration of Temperature Measurements using Thermocouples

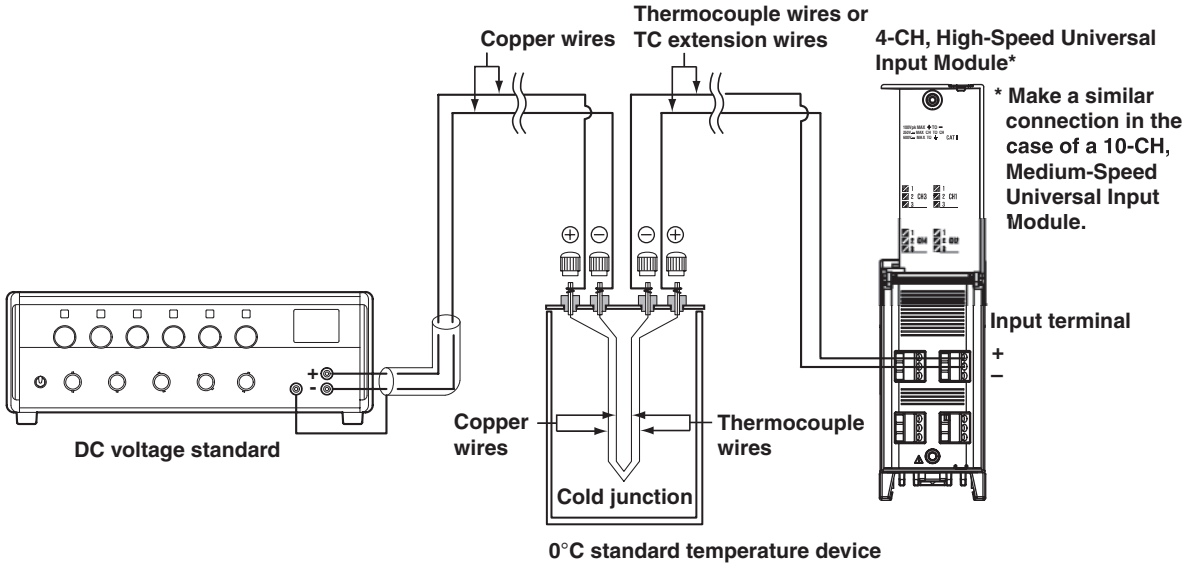
Required Instruments

- DC voltage standard
  Must meet the following specifications (5520A by FLUKE or equivalent):
  Output accuracy: ±(0.005% + 1 μV) or less
- 0°C standard temperature device
  Must meet the following specifications (ZC-114/ZA-10 by Coper Electronics or equivalent)
  Standard temperature stability accuracy: ±0.05°C or less

Reference Junction Compensation of Thermocouple Input

As the input terminal of the universal input module is generally at room temperature, the actual output of the thermocouple is different from the values given on the thermoelectromotive force table based on 0 °C. The universal input module performs compensation by measuring the temperature at the input terminal and adding the corresponding thermoelectromotive force to the actual output of the thermocouple. Therefore, when the measurement terminal is shorted (equivalent to the case when the detector tip is 0 °C), the measured value indicates the temperature of the input terminal. When calibrating the universal input module, this compensation voltage (thermoelectromotive force of 0 °C reference corresponding to the input terminal temperature) must be subtracted from the output of the standard generator before application. As shown in the figure, by using the 0°C standard temperature device to compensate the reference junction at 0 °C, you can input the thermoelectromotive force of 0 °C reference from the DC voltage standard and perform the calibration.

Wiring Diagram



Note

- Unlike the range calibration of the DC voltage or RTD, the input section cannot be adjusted in the calibration of the temperature measurement on the MX100 Data Acquisition Unit using thermocouples, If the accuracy specifications (see sections 4.4 and 4.5) are not met by the calibration of the temperature measurement using thermocouples, carefully check the input error and other factors, and contact your nearest YOKOGAWA dealer.
- If errors exist in the thermocouple wires and TC extension wires, correct calibration is not possible. Be sure to use a calibrated thermocouple.

3.4 Maintenance of Parts

The MX100 does not have parts that need periodic replacement.
However, the main module (MX100) uses expendable parts as indicated in the table below. There are no replacement services for the parts listed.
If you are to use the MX100 for an extended time, repair or repurchase the main module by referring to the service life of the parts and taking into consideration the actual usage conditions.

Part Name	Service Life	Note
Lithium battery	Approx. 10 years	When used under standard operating conditions. One battery is used.
Aluminum electrolytic capacitor	Approx. 10 years	When used under standard operating conditions.

Note

The main module also has a fuse, but the customer cannot replace it. If the fuse blows, contact your nearest YOKOGAWA dealer for repairs.
[Reference] Fuse rating
Maximum rated voltage: 250 V, maximum rated current: 3.15 A, type: time lag (T)

3.5 MX100 Maintenance and Test Using Communication Commands

The MX100 maintenance/test function is used by a network administrator to check the communication status of the MX100.
Maintenance and Test of the MX100 using communication commands can be carried out by connecting the main module and the PC using an Ethernet cable and using a terminal emulator such as Telnet on the PC. The communication method is a command and response type (a command is sent from the PC to the MX100 and a response is returned from the MX100 to the PC). Only a single PC can connect to a single MX100.

Connecting the Main Module and the PC

See “Connection Procedure” in section 2.6, “Connecting the Ethernet Cable.”

Setting the Terminal Emulator

When carrying out maintenance and test of the MX100 using communication commands, set the terminal emulator as indicated below. Specify the IP address of the MX100 and a port number of 34317 for the destination of the terminal emulator.

- Local echo: ON
- Line feed code of the transmit data: CR+LF

List of Maintenance/Test Commands

Command Name	Function
con	Outputs TCP connection information.
eth	Outputs statistical information of Ethernet (data link layer).
help	Outputs command help.
net	Outputs other network information.
quit	Quits maintenance/test (drops the connection).

Specifications of the Maintenance/Test Port

Port number	34317/tcp
Transfer data	ASCII code
Line feed code (command)	CR+LF or LF
Line feed code (response)	CR+LF
Receive buffer	128 B
Transmit buffer	8192 B
Connection timeout	3 min (fixed*)
Maximum number of simultaneous connections	1

* You cannot change the connection timeout setting.

con Output connection information

Function Outputs a list of connection information of the devices connected to the MX100.

Setting `con`

Example
```
con
EA
03/01/01 00:02:45.490

Active Connections

Proto Local Address          Foreign Address      State
TCP    10.  0. 233. 25:34316 10.  0.232.124:1382  ESTABLISHED
TCP    10.  0. 233. 25:34317 10.  0.232.124:1380  ESTABLISHED
TCP     0.  0.   0.  0:34316  0.  0.  0.  0:   0  LISTEN
TCP     0.  0.   0.  0:34317  0.  0.  0.  0:   0  LISTEN
EN
```

Description Outputs a list of connections in a form enclosed by EA and EN.

- Proto: Protocol used
- Local Address: MX100 address and port number
- Foreign Address: PC address and port number
- State: connection status (ESTABLISHED, LISTEN, CLOSE_WAIT...)

The maximum number of connections that is output as connection information is 24.

eth Output Ethernet statistical information

Function Outputs statistical information of the packets that flowed through the MX100 interface (lo0: loopback device, lan0: network device). The output value is a summed value after the MX100 is powered up.

Setting `eth`

Example
```
eth
EA
03/01/01 00:02:45.490

Ethernet Statistics

Name   In Pkt  In Err  Out Pkt  Out Err  16 Coll
lo0    0       0       0        0        0
lan0   1492    176     93       0        0
EN
```

Description Outputs statistical information of the packets that flowed through the interface in a form enclosed by EA and EN.

- Name: Interface name (lo: loopback, lan0: Ethernet)
- In Pkt: Number of received packets
- In Err: Number of packets that generated receive errors
- Out Pkt: Number of transmitted packets
- Out Err: Number of packets that generated transmit errors
- 16 Coll: Number of 16 collision occurrences

help Output help

Function: Outputs command help. If a command name is specified as a parameter, a simple explanation of its usage is output.

Setting:
```
help[, p1]
```
(p1: specifies the command name for outputting help. con, eth, help, net, or quit)

Example 1:
```
help
EA
03/01/01 00:02:45.490

Command Help

con    - echo connection status
eth    - echo ethernet statistics
help   - echo help
net    - echo network statistics
quit   - close this connection
EN
```

Example 2:
```
help, help
EA
help[, <command name>] - echo help
EN
```

Description: Outputs a command help or a description of how to use the command in a form enclosed by EA and EN. If an invalid command is specified, an error is output in the form “E1 Unknown command (CR+LF).”

net Output other network information

Function: Outputs settings and statistical information (APP, TCP, and DLC) specific to the MX100. The output value is a value at the time the MX100 is powered up or a summed value after the MX100 is powered up.

Setting:
```
net
```

Example:
```
net
EA
03/01/01 00:02:45.490

Network Statistics

APP: applalive     = 180 min
TCP: keepalive     = disable
TCP: connects      = 1
TCP: closed        = 1
TCP: timeoutdrop   = 0
TCP: keepdrops     = 1
TCP: sndtotal      = 5
TCP: sndbyte       = 71
TCP: sndrexmitpack = 0
TCP: sndrexmitbyte = 0
TCP: rcvtotal      = 10
TCP: rcvbyte       = 5
DLC: 16 collisions = 0
DLC: speed         = 100 Mbps
EN
```

Description Outputs settings and statistical information specific to the MX100 in a form enclosed by EA and EN.

APP: applalive:	APP keepalive check cycle.
TCP: keepalive:	TCP keepalive check cycle.
TCP: connects:	Total number of connections established.
TCP: closed:	Total number of dropped connections.
TCP: timeoutdrop:	Total number of dropped connections due to TCP retransmission timeout (if the transmitted packet (the unit of transmitted data) is not received, the packet is automatically retransmitted at a predetermined time interval. If the packet is not received after 14 retransmissions, timeout occurs and the connection is dropped.)
TCP: keepdrops:	Total number of dropped connections due to TCP keepalive timeout.
TCP: sndtotal:	Total number of transmitted packets.
TCP: sndbyte:	Total number of transmitted bytes.
TCP: sndrexmitpack:	Total number of retransmitted packets.
TCP: sndrexmitbyte:	Total number of retransmitted bytes.
TCP: rcvtotal:	Total number of received packets.
TCP: rcvbyte:	Total number of received bytes.
DLC: 16 collisions:	Number of collisions that occurred (A collision occurs when two or more devices on the network attempt to transmit simultaneously. The tendency for collisions to occur increases when the network is congested. 16 collisions refers to 16 consecutive collision incidents.)
DLC: speed:	Link speed

quit Quit maintenance/test (drop the connection of the device in operation)

Function Drops the connection between the PC and the MX100.

Setting `quit`

Example
```
quit
E0
```

Description After “E0” is returned, a disconnect request (FIN) is issued from the MX100.

4.1 Common Specifications

Standard Operating Conditions

Operating temperature range:
0 to 50°C
Operation humidity range:
20 to 80% RH for 0 to 40°C
10 to 50% RH for 40 to 50°C

Rated supply voltage:	AC power supply, 100 to 240 VAC
Supply voltage range used:	AC power supply, 90 to 250 VAC
Power supply frequency:	50 Hz ± 2%, 60 Hz ± 2%
Power consumption:	Up to approximately 70 VA maximum when six modules are used
Vibration:	10 to 60 Hz 0.2 m/s^2 or less
Shock:	Not allowed
Magnetic field:	400 A/m or less (50/60 Hz)
Position:	Upright and horizontal to ground
Structure:	Not explosion-proof
Usage location:	Indoors
Operating altitude:	2000 m or less
Installation category:	II (by IEC1010-1:1992)
Pollution degree:	2 (by IEC1010-1)

Transport and Storage Conditions

Environmental conditions during transport and storage
Storage ambient temperature:
–25 to 60°C
Storage ambient humidity:
5% to 95% RH (no condensation)

Vibration:	10 to 60 Hz 4.9 m/s^2 or less
Shock:	392 m/s^2 or less (packaged condition)

Mechanical Specifications

External dimensions:	Approx. 442 × 131 × 159 mm (when six slots are attached)
Weight:	Approx. 4.1 kg (maximum total weight)
Installation method:	Desktop or floor, panel mount, or attached to a DIN rail
Material:	Steel plate, aluminum die-cast, molded plastic resin

Supported Standards

CSA:	Obtained CSA22.2 No.1010.1-M1992	
UL:	Obtained UL3111-1(CSA NRTL/C)	
CE:	EMC directive EN61326-1	
	Low voltage directive	EN61010-1:1992 installation category II, pollution degree 2

4.2 Main Module Specifications

Measurement

Measurement range and accuracy:
See the measurement range and accuracy given in the specifications of each input module.

Maximum number of inputs:
60 inputs (except, up to six modules can be controlled)

Measurement interval: 10, 50, 100, 200, 500 ms, 1, 2, 5, 10, 20, 30, or 60 s
Up to three types of the intervals defined for the input module can be set (multi-interval).

Synchronization between modules:
Synchronized within the same sampling interval (in the same unit)

Synchronization between channels:
4-CH, High-Speed Universal Module: Synchronized between channels
10-CH, Medium-Speed Module: Not synchronized between channels (scanning type A/D converter)

Time setting: Configured based on the time information sent from the PC at the start of measurement

Filter function: First-order lag filter, applicable measurement types: DC voltage, TC, and RTD
You can select a time constant (time until 63.2% of the output value is reached) corresponding to the sampling interval indicated in the table below.
Time constant = measurement interval × N (where N = 5, 10, 20, 25, 40, 50, or 100)

Measurement Interval (s)	Selectable Time Constants (s)						
	N = 5	N = 10	N = 20	N = 25	N = 40	N = 50	N = 100
0.01	0.05	0.1	0.2	0.25	0.4	0.5	1
0.05	0.25	0.5	1	1.25	2	2.5	5
0.1	0.5	1	2	2.5	4	5	10
0.2	1	2	4	5	8	10	20
0.5	2.5	5	10	12.5	20	25	50
1	5	10	20	25	40	50	100
2	10	20	40	50	80	100	200
5	25	50	100	125	200	250	500
10	50	100	200	250	400	500	1000
20	100	200	400	500	800	1000	2000
30	150	300	600	750	1200	1500	3000
60	300	600	1200	1500	2400	3000	6000

Temperature unit switching:
Switch between °C and °F

Computation

Computation performed on the main module

Difference computation between channels:
Difference computation between arbitrary channels (DC voltage, TC, RTD, DI, and scaling)

Linear scaling: Possible scaling ranges: DC voltage, TC, RTD, and DI
Scaling range: –30000 to 30000
Scaling display range: –32000 to 32000
Decimal point position: Any

Remote RJC

When the item to be measured is located at a great distance, you can setup relay terminals near the item, measure between the relay terminal and the input terminal of the universal input module (reference channel) using thermocouples, and use the resultant value as the reference junction compensation of the temperature measurement. Use the same type of thermocouple on the reference channel and the measurement channel.

Alarms

Alarms available on the main module (active even when communication is disconnected)

Alarm types:	Upper limit, lower limit, differential upper limit, and differential lower limit
Number of settings:	Two items per channel
Alarm setting range:	DCV, TC, RTD, DI, and scaling
Hysteresis:	Alarm ON/OFF values are set arbitrarily.
Number of alarm outputs:	10 to 60 outputs (10 points per DO module)
Output mode:	Energized/De-energized, OR*, hold/non-hold, and command output**

* OR of 1 ch can be used on the MX100 Standard Software

** At least 100 ms is required for the response time for detecting changes in the command output.

Data Storage

Saves measured data when communication is cut off while recording measured data on the PC

Supported external media:	CF card (up to 2 GB) Type II × 1 slot (Type I can be used)
Save trigger:	When the timeout time elapses after the communication is cut off while recording measured data on the PC (the timeout time refers to the time from the point when the communication between the PC and MX100 is disconnected and acquisition of measured data is stopped to the point when data storage to the CF card starts, the setting is 60 s)
Save mode:	The following two modes are available for the save operation when communication is disconnected.

Rotary:

Retains the most-recent measured data. Data is saved while securing free space. Saves data to up to 30 files while deleting files in order from the file with the oldest time stamp in the root directory (subdirectories are not applicable). The data that is deleted is not necessarily a MX100 file. If free space cannot be secured or when securing of free space takes extended time, an error is indicated on the 7-segment LED. For details, see “Media-Related Errors” in section 3.1.

FullStop:

Retains the oldest measured data. Stops saving data when there is no more free space on the CF card.

Status detection: There are two types of statuses.
CF card inserted: yes/no, CF card use: yes/no
- When the CF card is not inserted:
  Inserted: No, Use: No
- When the CF card is inserted:
  Inserted: Yes, Use: Yes
- When an error is occurring:
  Inserted: Yes, Use: No
- After pressing the access stop switch**:
  Inserted: Yes, Use: No

* If a media-related error occurs and the card can no longer used, further data storage (excluding the case when a log file can be created) is stopped. To clear this condition, press the access stop switch (see section 2.8) and eject the CF card. Check the contents of the CF card and log file on the PC, and insert the CF card again.

** If you press the access stop switch and the card can no longer be used, further data storage (excluding the creation of a log file) is stopped. The status is automatically cleared the next time recording is started.

Timeout time: Default setting is 60 s (can be changed using the MX100/DARWIN API sold separately)
To save the data so that no dropouts occur, the timeout time* must be set appropriately. If the setting is inappropriate, an error is indicated on the 7-segment LED, and data storage is not performed. For details on the display on the 7-segment LED, see “Media-Related Errors” in section 3.1.

* Timeout time setting (guideline)
Timeout time [s] < 2 [MB]/(data size per second) – 20 [s]
Data size per second is the total for all measurement intervals.
Data size per second for each measurement interval
= Time 16 [bytes] + (measured value 4 [bytes] × the number of channels)/measurement interval [s]
Example:
Measurement interval: 10 ms (1 type), number of channels: 60 ch
Data size = (16 bytes + (4 bytes×60))/(10×10–3 [s])
= 25600 bytes
Thus, the timeout time is
(2 [MB]/25600 bytes)–20 [s] = 61.9 [s] >60 [s]

Saved channels: Channels monitored by the PC
(Not the channels being recorded.))

Save interval: 60 s (automatically save using the timeout time as the save interval)

File size: Approx. 5 MB/file (for a file with minimum measurement interval)

Data size per channel: 4 bytes/channel

File name: MDDIXXXX.MXD

M: Month when saving started (local time), 1-9, X (October), Y (November), Z (December)

DD: Data when saving started (local time), 1-31

I: Measurement interval number, 0-2, Up to three types in order from the shortest measurement interval
If the measurement interval is the same even when the measurement group is different, the data is saved to a single file of the same measurement interval number.

XXXX: Sequence number 0000-9999

MXD: Extension (upper-case characters) specific to the MX100

Guarantee of data during power failure:

Writing of data up to immediately before the power failure is guaranteed.
(Saving (backup) is not continued after the power failure recovers.)

Equation for calculating the size of the saved file:

Size of the saved file bytes = header size* + (data size**×write count***)

* Header size = 416 [bytes] + 176×the number of saved channels

** Data size = 4 [bytes]×the number of saved channels×sample count
Sample count = Save interval [s]/measurement interval [s]

*** Write count = ((5 [MB] – header size)/(data size)) truncated to an integer

Example:

Measurement interval: 10 ms, number of channels: 24 ch
Header size = 416 [bytes] + 176 [bytes]×24 = 4640 [bytes]
Data size = 4 [bytes]×24×(60 [s]/0.01 [s]) = 576000 [bytes]
Write count = (5 [MB] – 4640 [bytes])/576000 [bytes] = 9.1 ≈ 9
Thus, the file size is
4640 [bytes] + (576000 [bytes]×9) = 5188640 [bytes]

Guideline of the sample time for the different CF card sizes (when one type of measurement interval is used

Number of Saved CHs	Measurement Interval	Capacity of the CF card				
		32 MB (6 files)	64 MB (12 files)	128 MB (25 files)	256 MB (51 files)	512 MB (102 files)
10 CHs	10 ms	2 hours	4 hours	9 hours	18 hours	36 hours
	50 ms	10 hours	21 hours	45 hours	3 days	7 days
	100 ms	21 hours	43 hours	3.5 days	7 days	15 days
	200 ms	43 hours	3 days	7 days	15 days	30 days
	500 ms	4.5 days	9 days	18.5 days	38 days	75.5 days
	1 s	9 days	18 days	37 days	77 days	154 days
	2 s	18 days	36 days	75.5 days	154 days	303 days
24 CHs	10 ms	54 min.	1 hour40 min.	3.5 hours	7 hours	15 hours
	50 ms	4 hours	9 hours	18 hours	38 hours	77 hours
	100 ms	9 hours	18 hours	37 hours	77 hours	6 days
	200 ms	18 hours	36 hours	75 hours	6 days	12 days
	500 ms	45 hours	3 days	7.5 days	16 days	31.5 days
	1 s	3 days	7 days	15 days	32 days	64 days
	2 s	7.5 days	15 days	31.5 days	64 days	126 days
60 CHs	10 ms	18 min.	40 min.	1 hour15 min.	3 hours	5 hours
	50 ms	1 hour	3 hours	7 hours	15 hours	30 hours
	100 ms	3.5 hours	7 hours	15 hours	30 hours	2.5 days
	200 ms	7 hours	14 hours	30 hours	2 days	5 days
	500 ms	18 hours	36 hours	3 days	6 days	12.5 days
	1 s	36 hours	3 days	6 days	12 days	25 days
	2 s	3 days	6 days	12.5 days	25 days	50 days

Display

LED: Ethernet communication status (LINK, ACT)

Two-digit 7-segment LED: Status of the MX100 Data Acquisition Unit (unit number, operation status, and error indication)

Communications

Interface: Ethernet (10BASE-T/100BASE-TX)

Connector type: RJ-45

Protocol: TCP, IP, UDP, ARP, and ICMP

Transmission function: Transmits measured values and settings

Reception function: Receives settings

TCP connection timeout: If there is no packet exchange over three minutes (not configurable) when using TCP, a connection timeout occurs. This timeout mainly occurs when using the MX100/DARWIN API (software sold separately).

Other Functions

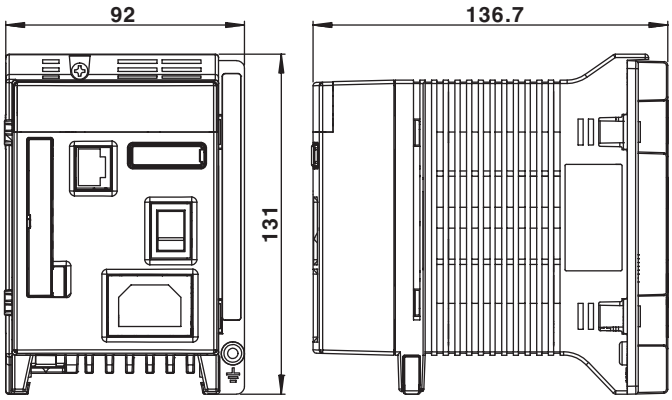
Time function:	Normally operations on the PC's clock Backup function available (records the times of the data using time stamps of the main module when communication is cut off)
Internal clock accuracy:	±100 ppm
Dipswitches:	Used to initialize settings, etc. (number of switches: 8)
Access stop switch for the CF card:	
	Closes the file to which data is being written on the CF card Saves the log file.

General Specifications

Power consumption:	Approx. 8 W
Insulation resistance:	20 MΩ or more at 500 VDC between the power supply terminal and earth terminal
Withstand voltage:	1500 VAC (50/60 Hz) for one minute between the power supply terminal and earth terminal
External dimensions:	Approx. 92 (W) × 131 (H) × 137 (D) mm
Weight:	Approx. 0.85 kg

External Dimensions

Unit: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

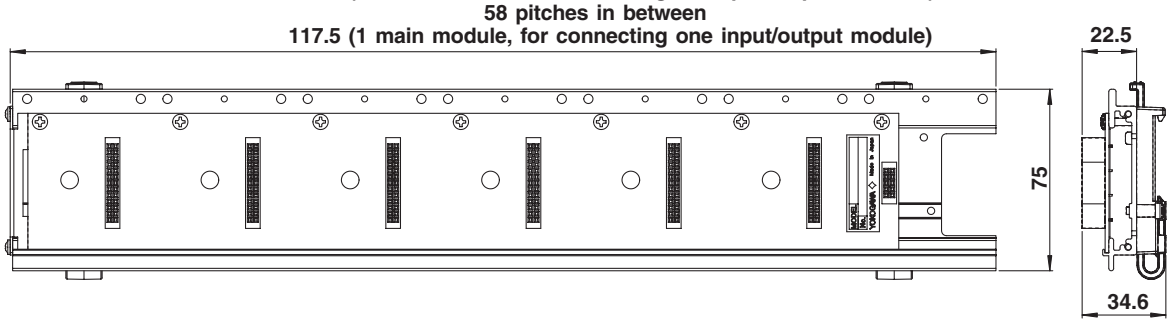
4.3 Base Plate Specifications

Number of main modules that can be attached:
1 (always attached)
Number of input/output modules that can be attached:
1 to 6 (specified by the suffix code)
External dimensions: Approx. 118 to 408 (W) × 75 (H) × 35 (D) mm
Weight: Approx. 0.37 kg (1 main module, for connecting six input/output modules)

External Dimensions

Unit: mm

MX150-1, -2, -3, -4, -5, -6


407.5 (1 main module, for connecting six input/output modules)
58 pitches in between
117.5 (1 main module, for connecting one input/output module)
22.5
75
34.6

If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

4.4 4-CH, High-Speed Universal Input Module Specifications

Type of measurement: DC voltage, TC, RTD, DI (contact, LEVEL)
Number of inputs: 4 inputs
Input method: Floating unbalanced input, insulation between channels
A/D resolution: 16 bits (±20000/±6000)
Measurement range and accuracy:

The accuracy applies to standard operating conditions: ambient temp: 23±2°C, ambient humidity: 55±10% RH, supply voltage: 90 to 250 VAC, power frequency: 50/60 Hz ± 1%, warm-up time: at least 30 minutes, without adverse conditions such as vibrations.

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 1.67 ms	Highest Resolution (1 Digit)
DC voltage	20 mV	–20.000 to 20.000 mV	±(0.05% of rdg + 5 digits)	±(0.1% of rdg + 25digits)	1 μV
	60 mV	–60.00 to 60.00 mV	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10digits)	10 μV
	200 mV	–200.00 to 200.00 mV	±(0.05% of rdg + 2 digits)		10 μV
	2 V	–2.0000 to 2.0000 V	±(0.05% of rdg + 5 digits)		100 μV
	6 V	–6.000 to 6.000 V	±(0.05% of rdg + 2 digits)		1 mV
	20 V	–20.000 to 20.000 V	±(0.05% of rdg + 2 digits)		1 mV
	100 V	–100.00 to 100.00 V	±(0.05% of rdg + 2 digits)		10 mV
Thermocouple (excludes RJC accuracy, when burnout is OFF)	R[1]	0.0 to 1760.0°C	±(0.05% of rdg + 1°C) Except 0 to 100°C: ±3.7°C, 100 to 300°C: ±1.5°C for R and S; 400 to 600°C: ±2°C, less than 400°C: not guaranteed for B	Not measurable	0.1°C
	S[1]				
	B[1]	0.0 to 1820.0°C			
	K[1]	–200.0 to 1370.0°C	±(0.05% of rdg + 0.7°C) Except –200°C to –100°C: ±(0.05% of rdg + 1°C)		
	E[1]	–200.0 to 800.0°C	±(0.05% of rdg + 0.5°C) Except –200°C to –100°C: ±(0.05% of rdg + 0.7°C) for J and L		
	J[1]	–200.0 to 1100.0°C			
	T[1]	–200.0 to 400.0°C			
	L[2]	–200.0 to 900.0°C			
	U	–200.0 to 400.0°C			
	N[3]	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)		
	W[4]	0.0 to 2315.0°C	±(0.05% of rdg + 1°C)		
	KPvsAu7Fe	0.0 to 300.0K	±(0.05% of rdg + 0.7K)		0.1K
RTD (Measurement current: 1 mA)	Pt100[5]	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	Not measurable	0.1°C
	JPt100[5]	–200.0 to 550.0°C			
	Pt100 (high res.)	–140.00 to 150.00°C	±(0.05% of rdg + 0.3°C)	Not measurable	0.01°C
	JPt100 (high res.)	–140.00 to 150.00°C			
	Ni100 SAMA[6]	–200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	Not measurable	0.1°C
	Ni100 DIN[6]	–60.0 to 180.0°C			
	Ni120[7]	–70.0 to 200.0°C			
RTD (Measurement current: 2 mA)	Pt100[5]	–200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	Not measurable	0.1°C
	JPt100[5]	–200.0 to 250.0°C			
	Pt100 (high res.)	–140.00 to 150.00°C	±(0.05% of rdg + 0.3°C)	Not measurable	0.01°C
	JPt100 (high res.)	–140.00 to 150.00°C			
	Pt50[5]	–200.0 to 550.0°C	±(0.05% of rdg + 0.3°C)	Not measurable	0.1°C
	Cu10 GE[8]	–200.0 to 300.0°C	±(0.1% of rdg + 0.7°C)		
	Cu10 L&N[8]	–200.0 to 300.0°C			
	Cu10 WEED[8]	–200.0 to 300.0°C			
	Cu10 BAILEY[8]	–200.0 to 300.0°C			
	J263B	0.0 to 300.0K	±(0.05% of rdg + 0.3K)	Not measurable	0.1K
DI	Level	Vth = 2.4 V	Threshold level accuracy: ±0.1 V		
	Contact input	ON for 100 Ω or less, OFF for 10 kΩ or more[9]			

1 R, S, B, K, E, J, T: ANSI, IEC 584, DIN IEC 584, JIS C 1602-1981
2 L: Fe-CuNi, DIN43710/U: Cu-CuNi, DIN 43710
3 N: Nicrosil-Nisil, IEC 584, DIN IEC 584
4 W: W•5%RE-W•26%Re (Hoskins Mfg Co)
5 Pt50: JIS C 1604-1981, JIS C 1606-1986/Pt100: JIS C 1604-1989, JIS C 1606-1989, IEC 751, DIN IEC 751/
JPt100: JIS C 1604-1981, JIS C 1606-1989
6 SAMA/DIN
7 McGRAW EDISON COMPANY
8 Guaranteed accuracy range Cu10 GE: –84.4 to 170.0°C/Cu10 L&N: –75.0 to 150.0°C/Cu10 WEED: –20.0 to 250.0°C/
Cu10 BAILEY: –20.0 to 250.0°C
9 Measured using a measurement current of approximately 1 mA at 2-V range. Threshold level is approximately 0.8 V.

The inputs indicated below can be used on MXLOGGER or MX100/DARWIN API (software sold separately.

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 1.67 ms	Highest Resolution (1 Digit)
DC voltage	60 mV (high res.)	0.000 to 60.000 mV	±(0.05% of rdg + 20digits)	±(0.1% of rdg + 100 digits)	1 μV
	1 V	–1.0000 to 1.0000 V	±(0.05% of rdg + 2digits)	±(0.1% of rdg + 10 digits)	100 μV
	6 V (high res.)	0.0000 to 6.0000 V	±(0.05% of rdg + 20digits)	±(0.1% of rdg + 100 digits)	100 μV
Thermocouple (excludes RJC accuracy, when burnout is OFF)	PLATINEL	0.0 to 1400.0°C	±(0.05% of rdg + 1°C)	Not measurable	0.1°C
	PR40-20	0.0 to 1900.0°C	±(0.05% of rdg + 2.5°C) Except 300 to 700°C: ±6°C less than 300°C: not guaranteed		
	NiNiMo	0.0 to 1310.0°C	±(0.05% of rdg + 0.7°C)		
	WRe3-25	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 0 to 200°C: ±2.5°C 2000°C or higher: ±(0.05% of rdg + 4°C)		
	W/WRe26	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 100 to 300°C: ±4°C less than 100°C: not guaranteed		
	Type-N(AWG14)	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)		
RTD (Measurement current: 1 mA)	Pt100 (high noise resistance)	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	Not measurable	0.1°C
	JPt100 (high noise resistance)	–200.0 to 550.0°C			
RTD (Measurement current: 2 mA)	Cu10 at 20°C alpha = 0.00392	–200.0 to 300.0°C	±(0.1% of rdg + 0.7°C)	Not measurable	0.1°C
	Cu10 at 20°C alpha = 0.00393	–200.0 to 300.0°C			
	Cu25 at 0°C alpha = 0.00425	–200.0 to 300.0°C	±(0.1% of rdg + 0.5°C)	Not measurable	0.1°C
	Cu53 at 0°C alpha = 0.00426035	–50.0 to 150.0°C	±(0.05% of rdg + 0.3°C)	Not measurable	0.1°C
	Cu100 at 0°C alpha = 0.00425	–50.0 to 150.0°C			
	Pt25(JPt100*1/4)	–200.0 to 550.0°C	±(0.1% of rdg + 0.5°C)	Not measurable	0.1°C
	Cu10 GE (high resolution)	–200.0 to 300.0°C	±(0.1% of rdg + 0.7°C)	Not measurable	0.1°C
	Cu10 L&N (high resolution)	–200.0 to 300.0°C			
	Cu10 WEED (high resolution)	–200.0 to 300.0°C			
	Cu10 BAILEY (high resolution)	–200.0 to 300.0°C			
	Pt100 (noise resistance)	–200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	Not measurable	0.1°C
	JPt100 (noise resistance)	–200.0 to 250.0°C			

Measurement interval, integration time, and filter:

Measurement Interval	Integration Time	Filter	Rejected Noise and Notes
10 ms	1.67 ms	Rectangular	600 Hz and its integer multiples, temperature measurement not possible
50 ms	16.67 ms		60 Hz and its integer multiples
	20 ms		50 Hz and its integer multiples
	Auto		Automatically detects the power supply frequency and set 16.67 or 20 ms
100 ms	36.67 ms	Trapezoidal	50 Hz or 60 Hz and their integer multiples
200 ms			
500 ms	100 ms	Rectangular	10 Hz and its integer multiples
1 s	200 ms	Cos	Fc = 5-Hz low-pass filter
2, 5,10, 20, 30, 60 s			

Reference junction compensation:

Switch between external and internal on each channel, remote RJC function available (see page 4-3)

Reference junction compensation accuracy:

When measuring temperature greater than or equal to 0 °C and when the temperature of the input terminal is balanced

Type R, S, and W: ±1°C

Type K, J, E, T, N, L, U: ±0.5°C

Type N (AWG14), PLATINEL, NiNiMo, WRe3-25, and W/WRe26: ±1°C

Note: The internal reference junction compensation is fixed to 0°C for type B and PR40-20

Maximum input voltage:
DC voltage at 1-V range or less, TC, RTC, and DI (contact): ±10 VDC (continuous)
Other measurement ranges: ±120 VDC (continuous)

Normal-mode voltage: DC voltage, TC, DI (LEVEL): 1.2 times the range rating or less (50/60 Hz, peak value including the signal component)
RTD 100 Ω system: 50 mV peak
RTD 10, 25, 50 Ω systems: 10 mV peak

Normal-mode rejection ratio:
When the integration time is 16.67 ms or more: 40 dB or more (50/60 Hz ± 0.1%)
When the integration time is 1.67 ms: 50/60 Hz is not rejected

Common-mode voltage:
600 VACrms (50/60 Hz), reinforced (double) insulation

Common-mode rejection ratio (50/60 Hz ± 0.1%, 500 Ω unbalanced, between the minus terminal and ground):
When the integration time is 16.67 ms or more: 120 dB or more
When the integration time is 1.67 ms: 80 dB or more

Common-mode voltage between channels:
250 VACrms (50/60 Hz), reinforced (double) insulation

Noise rejection: Rejection by the integrating A/D converter and the use of low pass filters

Input resistance: DC voltage at 1 V range or less, TC range: 10 MΩ or more
DC voltage at 2 V range or more: Approx. 1 MΩ
When measurement is stopped: Approx. 1 MΩ

Insulation resistance: 20 MΩ or more at 500 VDC between the input and earth

Input bias current: 10 nA or less (except for burnout setting)

Withstand voltage: 2300 VAC (50/60 Hz) for one minute between input terminals
3700 VAC (50/60 Hz) for one minute between the input terminal and earth terminal

Input signal source resistance:
DC voltage and TC: 2 kΩ or less
RTD 50Ω and 100 Ω systems: 10 Ω or less per cable
RTD 10Ω and 25 Ω systems: 1 Ω or less per cable

Thermocouple burnout:
Superposed electric current system, detection within the thermocouple range (detection ON/OFF possible)
Up/Down setting is possible, current approximately 100 nA
2 kΩ or more is normal, 10 MΩ or more is burned out
Effect on measurement accuracy: ±15 μV or less (excluding the effect of signal source resistance)

Parallel capacity during RTD:
0.01 μF or less

Power consumption: Approx. 3 W

External dimensions: Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)

Weight: Approx. 0.5 kg

Terminal type: Clamp, detachable per channel

Applicable wire size: 0.2 to 2.5 mm^2 (AWG24 to 12)

Effects of Operating Conditions

The specifications below apply when the integration time is 16.67 ms or more.

Warm-up time: At least 30 minutes after power-up

Effects of ambient temperature:

The effect received by changes in 10°C increments of the ambient temperature is
±(0.05% of rdg + 0.05% of range) or less
Except ±(0.2% of range + 1 digit) for Cu10Ω

Effects of power fluctuation:

Meets the accuracy specifications for AC power supply in the range 90 to 132 V and 180 to 250 V

Effects of magnetic field:

The fluctuation for AC (50/60 Hz) and DC 400 A/m fields is ±(0.1% of rdg + 10 digits) or less

Effects from the signal source resistance:

Effects from a fluctuation of 1 kΩ in the signal source resistance on DC voltage and thermocouple

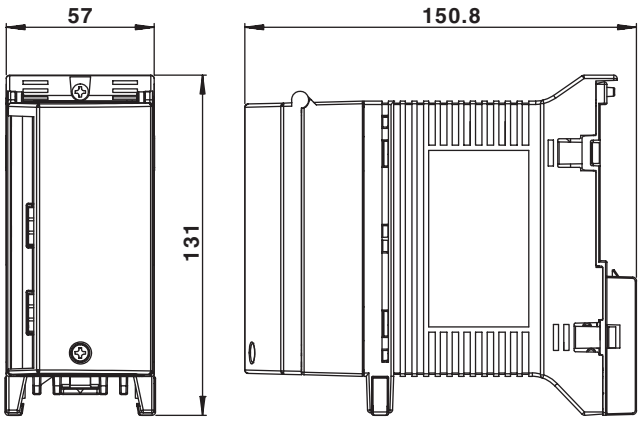
DC voltage:	1 V range or less	±10 μV or less
	2 V range or higher	±0.15% of rdg or less
Thermocouple:	±10 μV or less	
	Except, ±150 μV or less for burnout setting.	
RTD:	Fluctuation due to 10 Ω change per cable (same resistance for the three wires) 100 Ω system: ±0.1°C or less, other systems: ±1.0°C or less, the fluctuation due to a difference in the resistance between wires 40 mΩ (maximum difference among three wires) is approximately 0.1°C (for Pt100)	

Effect of position: Horizontal with the feet at the bottom is the rule.

Effects of vibration: The fluctuation that results by applying a sinusoidal vibration along all three axis at a frequency between 10 to 60 Hz and an acceleration of 0.2 m/s^2 is ±(0.1% of rdg + 1 digit) or less

External Dimensions

Unit: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

4.5 10-CH, Medium-Speed Universal Input Module Specifications

Type of measurement: DC voltage, TC, RTD, DI (CONT, LEVEL)

Number of inputs: 10 inputs

Input method: Floating unbalanced input, insulation between channels (b terminal common for RTD)

A/D resolution: 16 bits (±20000/±6000)

Measurement range and accuracy:

The accuracy applies to standard operating conditions: ambient temp: 23±2°C, ambient humidity: 55±10% RH, supply voltage: 90 to 250 VAC, power frequency: 50/60 Hz ± 1%, warm-up time: at least 30 minutes, without adverse conditions such as vibrations.

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 1.67 ms	Highest Resolution (1 Digit)
DC voltage	20 mV	–20.000 to 20.000 mV	±(0.05% of rdg + 5 digits)	±(0.1% of rdg + 25digits)	1 μV
	60 mV	–60.00 to 60.00 mV	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10digits)	10 μV
	200 mV	–200.00 to 200.00 mV	±(0.05% of rdg + 2 digits)		10 μV
	2 V	–2.0000 to 2.0000 V	±(0.05% of rdg + 5 digits)		100 μV
	6 V	–6.000 to 6.000 V	±(0.05% of rdg + 2 digits)		1 mV
	20 V	–20.000 to 20.000 V	±(0.05% of rdg + 2 digits)		1 mV
	100 V	–100.00 to 100.00 V	±(0.05% of rdg + 2 digits)		10 mV
Thermocouple (excludes RJC accuracy, when burnout is OFF)	R[1]	0.0 to 1760.0°C	±(0.05% of rdg + 1°C) Except 0 to 100°C: ±3.7°C, 100 to 300°C: ±1.5°C for R and S; 400 to 600°C: ±2°C, less than 400°C: not guaranteed for B	±(0.1% of rdg + 4°C) Except 0 to 100°C: ±10°C, 100 to 300°C: ±5°C for R and S, 400 to 600°C: ±7°C, less than 400°C: not guaranteed for B	0.1°C
	S[1]				
	B[1]	0.0 to 1820.0°C			
	K[1]	–200.0 to 1370.0°C	±(0.05% of rdg + 0.7°C) Except –200°C to –100°C: ±(0.05% of rdg + 1°C)	±(0.1% of rdg + 3.5°C) Except –200°C to –100°C: ±(0.1% of rdg +6°C)	
	E[1]	–200.0 to 800.0°C	±(0.05% of rdg + 0.5°C) Except –200°C to –100°C: ±(0.05% of rdg + 0.7°C) for J and L	±(0.1% of rdg +2.5°C) Except –200°C to –100°C: ±(0.1% of rdg + 5°C)	
	J[1]	–200.0 to 1100.0°C			
	T[1]	–200.0 to 400.0°C			
	L[2]	–200.0 to 900.0°C			
	U	–200.0 to 400.0°C			
	N[3]	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 3.5°C)	
	W[4]	0.0 to 2315.0°C	±(0.05% of rdg + 1°C)	±(0.1% of rdg + 7 °C)	
	KPvsAu7Fe	0.0 to 300.0K	±(0.05% of rdg + 0.7K)	±(0.1% of rdg + 3.5 K)	0.1K
RTD (Measurement current: 1 mA)	Pt100[5]	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg +1.5°C)	0.1°C
	JPt100[5]	–200.0 to 550.0°C			
	Pt100 (high res.)	–140.00 to 150.00°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.01°C
	JPt100 (high res.)	–140.00 to 150.00°C			
	Ni100 SAMA[6]	–200.0 to 25.00°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Ni100 DIN[6]	–60.0 to 180.0°C			
	Ni120[7]	–70.0 to 200.0°C			
	Pt50[5]	–200.0 to 550.0°C			
	Cu10 GE[8]	–200.0 to 300.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	
	Cu10 L&N[8]	–200.0 to 300.0°C			
	Cu10 WEED[8]	–200.0 to 300.0°C			
	Cu10 BAILEY[8]	–200.0 to 300.0°C			
	J263B	0.0 to 300.0K	±(0.05% of rdg + 0.3K)	±(0.1% of rdg + 1.5K)	0.1K
DI	Level	Vth = 2.4 V	Threshold level accuracy: ±0.1 V		
	Contact input		ON for 100 Ω or less, OFF for 10 kΩ or more[9]		

1 R, S, B, K, E, J, T: ANSI, IEC 584, DIN IEC 584, JIS C 1602-1981
2 L: Fe-CuNi, DIN43710/U: Cu-CuNi, DIN 43710
3 N: Nicrosil-Nisil, IEC 584, DIN IEC 584
4 W: W•5%RE-W•26%Re (Hoskins Mfg Co)
5 Pt50: JIS C 1604-1981, JIS C 1606-1986/Pt100: JIS C 1604-1989, JIS C 1606-1989, IEC 751, DIN IEC 751/ JPt100: JIS C 1604-1981, JIS C 1606-1989
6 SAMA/DIN
7 McGRAW EDISON COMPANY
8 Guaranteed accuracy range Cu10 GE: –84.4 to 170.0°C/Cu10 L&N: –75.0 to 150.0°C/Cu10 WEED: –20.0 to 250.0°C/ Cu10 BAILEY: –20.0 to 250.0°C
9 Measured using a measurement current of approximately 10 μA at 200-mV range. The threshold level is 0.1 V.

The inputs indicated below can be used on MXLOGGER or MX100/DARWIN API (software sold separately.

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 1.667 ms	Highest Resolution (1 Digit)
DC voltage	60 mV (high res.)	0.000 to 60.000mV	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	1 μV
	1 V (high res.)	–1.0000 to 1.0000V	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10 digits)	100 μV
	6 V (high res.)	0.0000 to 6.0000V	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	100 μV
Thermocouple (excludes RJC accuracy, when burnout is OFF)	PLATINEL	0.0 to 1400.0°C	±(0.05% of rdg + 1°C)	±(0.1% of rdg + 4°C)	0.1°C
	PR40-20	0.0 to 1900.0°C	±(0.05% of rdg + 2.5°C) Except 300 to 700°C: ±6°C less than 300°C: not guaranteed	±(0.1% of rdg + 12°C) Except 300 to 700°C: ±25°C less than 300°C: not guaranteed	
	NiNiMo	0.0 to 1310.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 2.7°C)	
	WRe3-25	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 0 to 200°C: ±2.5°C 2000°C or higher: ±(0.05% of rdg + 4°C)	±(0.1% of rdg + 7°C) Except 0 to 200°C: ±12°C 2000°C or higher: ±(0.1% of rdg + 11°C)	
	W/WRe26	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 100 to 300°C: ±4°C less than 100°C: not guaranteed	±(0.1% of rdg + 8.5°C) Except 100 to 300°C: ±12°C less than 100°C: not guaranteed	
	Type-N(AWG14)	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 3.5°C)	
RTD (Measurement current: 1 mA)	Cu10 at 20°C alpha = 0.00392	–200.0 to 300.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C
	Cu10 at 20°C alpha = 0.00393	–200.0 to 300.0°C			
	Cu25 at 0°C alpha = 0.00425	–200.0 to 300.0°C	±(0.1% of rdg + 0.5°C)	±(0.2% of rdg + 2°C)	0.1°C
	Cu53 at 0°C alpha = 0.00426035	–50.0 to 150.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu100 at 0°C alpha = 0.00425	–50.0 to 150.0°C			
	Pt25(JPt100*1/4)	–200.0 to 550.0°C	±(0.1% of rdg + 0.5°C)	±(0.2% of rdg + 2°C)	0.1°C
	Cu10 GE (high res.)	–200.0 to 300.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C
	Cu10 L&N (high res.)	–200.0 to 300.0°C			
	Cu10 WEED (high res.)	–200.0 to 300.0°C			
	Cu10 BAILEY (high res.)	–200.0 to 300.0°C			
	Pt100 (noise resistance)	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	JPt100 (noise resistance)	–200.0 to 600.0°C			

Measurement interval, integration time, and filter:

Measurement Interval	Integration Time	Burnout Detection Cycle	Filter	Rejected Noise and Notes
100 ms	1.67 ms	1 s*	Rectangular	600 Hz and its integer multiples**
200 ms		Measurement interval		
500 ms	16.67 ms			60 Hz and its integer multiples
	20 ms			50 Hz and its integer multiples
	Auto			Automatically detects the power supply frequency and set 16.67 or 20 ms
1 s	36.67 ms		Trapezoidal	50 Hz or 60 Hz and their integer multiples
2 s	100 ms		Rectangular	10 Hz and its integer multiples
5 s	200 ms		Cos	Fc = 5-Hz low-pass filter
10, 20, 30, 60 s				

* When the measurement interval is 100 ms, burnout is detected in one channel per measurement interval. Therefore, if measurement is started in a burnout condition or after a burnout occurs, burnout cannot be detected for up to 10 measurements (approximately 1 second).

** Because the power supply frequency noise is not rejected, measured values may fluctuate particularly for temperature measurements using thermocouples. If this happens, make the measurement interval longer, or use the 4-CH High-Speed Universal Input Module.

Reference junction compensation:

Switch between external and internal on each channel, remote RJC function available (see page 4-3)

Reference junction compensation accuracy:
When measuring temperature greater than or equal to 0 °C and when the temperature of the input terminal is balanced
Type R, S, and W: ±1°C
Type K, J, E, T, N, L, and U: ±0.5°C
Type N (AWG14), PLATINEL, NiNiMo, WRe3-25, and W/WRe26: ±1°C
Note: The internal reference junction compensation is fixed to 0°C for type B and PR40-20

Maximum input voltage:
DC voltage at 1-V range or less, TC, RTC, and DI (contact): ±10 VDC (continuous)
Other measurement ranges: ±120 VDC (continuous)

Normal-mode voltage:
DC voltage, TC, DI (LEVEL): 1.2 times the range rating or less (50/60 Hz, peak value including the signal component)
RTD 100-Ω system: 50 mV peak
RTD 10, 25, 50 Ω systems: 10 mV peak

Normal-mode rejection ratio:
When the integration time is 16.67 ms or more: 40 dB or more (50/60 Hz ± 0.1%)
When the integration time is 1.67 ms: 50/60 Hz is not rejected

Common-mode voltage:
600 VACrms (50/60 Hz), reinforced (double) insulation

Common-mode rejection ratio (50/60 Hz ± 0.1%, 500 Ω unbalanced, between the minus terminal and ground):
When the integration time is 16.67 ms or more: 120 dB or more
When the integration time is 1.67 ms: 80 dB or more

Common-mode voltage between channels:
120 VACrms (50/60 Hz)

Noise rejection: Rejection by the integrating A/D converter and the use of low pass filters

Input resistance: DC voltage at 1 V range or less, TC range: 10 MΩ or more
DC voltage at 2 V range or more: Approx. 1 MΩ

Insulation resistance: 20 MΩ or more at 500 VDC between the input and earth

Input bias current: 10 nA or less (except for burnout setting)

Withstand voltage: 1000 VAC (50/60 Hz) for one minute between input terminals
3700 VAC (50/60 Hz) for one minute between the input terminal and earth terminal

Input signal source resistance:
DC voltage and TC: 2 kΩ or less
RTD 50Ω and 100 Ω systems: 10 Ω or less per cable
RTD 10Ω and 25 Ω systems: 1 Ω or less per cable

Thermocouple burnout:
Detection at a specified detection interval per measurement interval and detection within the thermocouple range (detection ON/OFF possible)
Up/Down setting is possible
2 kΩ or more is normal, 200 kΩ or more is burned out
(Parallel capacity of 0.01 μF or less), detection current of approximately 10 μA, and detection time of approximately 2 ms

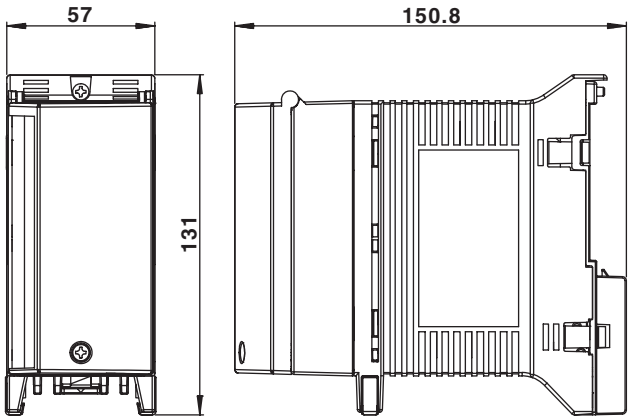
Parallel capacity during RTD:
0.01 μF or less
Power consumption: Approx. 1.2 W
External dimensions: Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)
Weight: Approx. 0.5 kg
Terminal type: Clamp, terminal board is detachable
Applicable wire size: 0.14 to 1.5 mm^2 (AWG26 to 16)

Effects of Operating Conditions

The specifications below apply when the integration time is 16.67 ms or more.
Warm-up time: At least 30 minutes after power-up
Effects of ambient temperature:
The effect received by changes in 10°C increments of the ambient temperature is
±(0.05% of rdg + 0.05% of range) or less
Except ±(0.2% of range + 1 digit) for Cu10Ω
Effects of power fluctuation:
Meets the accuracy specifications for AC power supply in the range 90 to 132 V and 180 to 250 V
Effects of magnetic field:
The fluctuation for AC (50/60 Hz) and DC 400 A/m fields is ±(0.1% of rdg + 10 digits) or less
Effects from the signal source resistance:
Effects from a fluctuation of 1 kΩ in the signal source resistance on DC voltage and thermocouple
DC voltage: 1 V range or less ±10 μV or less
2 V range or higher ±0.15% of rdg or less
Thermocouple: ±10 μV or less
RTD: Fluctuation due to 10 Ω change per cable (same resistance for the three wires) 100 Ω system: ±0.1°C or less, other systems: ±1.0°C or less, the fluctuation due to a difference in the resistance between wires 40 mΩ (maximum difference among three wires) is approximately 0.1°C (for Pt100)
Effect of position: Horizontal with the feet at the bottom is the rule.
Effects of vibration: The fluctuation that results by applying a sinusoidal vibration along all three axis at a frequency between 10 to 60 Hz and an acceleration of 0.2 m/s^2 is ±(0.1% of rdg + 1 digit) or less

External Dimensions

Unit: mm



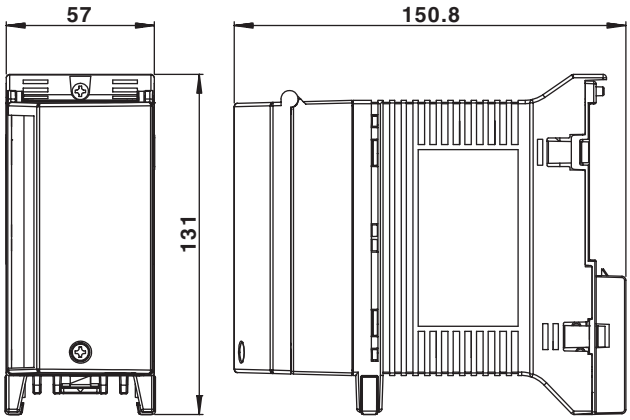
If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

4.6 10-CH, High-Speed Digital Input Module Specifications

Input type:	Non-voltage contact, open collector, and 5-V logic
Number of inputs:	10 inputs
Input format:	Pull-up at approximately 5 V/approximately 5 kΩ, no insulation between channels
Measurement interval:	Select 10 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, or 60 s
Filter:	Measurement interval of 5 s or less: Use the wider of the ON/OFF width of the detection period (approximately 75% to 90% of the measurement interval) Measurement interval of 5 s or more: Use the wider of the ON/OFF width of approximately 4.5 s
Minimum detection pulse width:	Twice the sampling interval or more
Input threshold level:	Non-voltage contact, open collector: ON at 100 Ω or less and OFF at 100 kΩ or greater 5-V logic: OFF at 1 V or less and ON at 3 V or greater
Hysteresis width:	Approx. 0.1 V
Contact/Transistor rating:	Contact with a rating of 15 VDC or greater and 30 mA or greater Transistor with a rating of Vce > 15 Vdc and Ic > 30 mA
Maximum input voltage:	±10 V
Insulation resistance:	20 MΩ or more at 500 VDC between the input terminal and ground
Withstand voltage:	2300 VAC (50/60 Hz) for one minute between the input terminal and earth terminal
Maximum common-mode voltage:	250 VAC (50/60 Hz)
Terminal type:	Clamp
Power consumption:	Approx. 1.5 W
Applicable wire size:	0.14 to 1.5 mm^2 (AWG26 to 16)
External dimensions:	Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)
Weight:	Approx. 0.5 kg

External Dimensions

Unit: mm



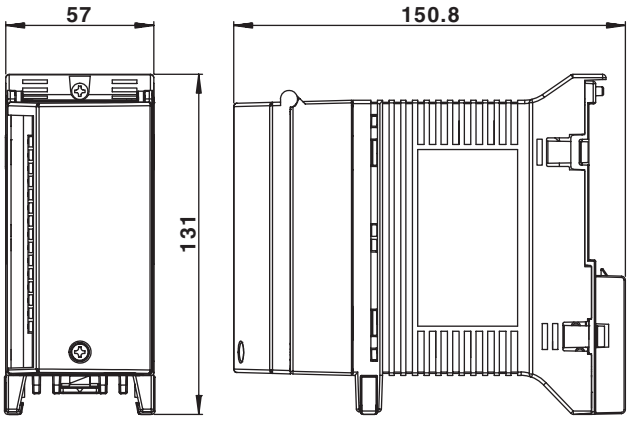
If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

4.7 10-CH, Medium-Speed Digital Output Module Specifications

Number of outputs:	10 outputs
Contact mode:	A contact (SPST)
Update interval:	Output per 100 ms (not synchronized to the measurement interval)
Contact capacity:	250 VDC/0.1 A, 250 VAC/2 A, or 30 VDC/2A (resistance load)
Contact life*:	100,000 times at rated load (typical) 20,000,000 times at no load (typical) * The contact life varies depending on the load conditions and the environment in which it is used.
Insulation resistance:	20 MΩ or more at 500 VDC between the output terminal and earth 20 MΩ or more at 500 VDC between output terminals
Withstand voltage:	2300 VAC (50/60 Hz) for one minute between the output terminal and earth 2300 VAC (50/60 Hz) for one minute between output terminals
Maximum common-mode voltage:	250 VAC
Power consumption:	Approx. 2 W (when all relays are turned ON)
Terminal type:	Clamp, attached and removed in units of 5 channels
Applicable wire size:	0.08 to 2.5 mm^2 (AWG28 to 12)
External dimensions:	Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)
Weight:	Approx. 0.5 kg

External Dimensions

Unit: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

Index

Symbols

10-CH, High-Speed Digital Input Module 1-2, 1-14, 4-17
10-CH, Medium-Speed Digital Output Module 1-3, 1-15, 4-18
10-CH, Medium-Speed Universal Input Module 1-2, 1-12, 4-12
4-CH, High-Speed Universal Input Module 1-2, 1-10, 4-8
5-V logic input 2-8
7-segment LED 1-7, 3-1

A

access stop switch 2-15
ACT LED 2-12
alarm output timing 1-7
alarms 1-6
API for the MX100/DARWIN ..... vi, 1-1

B

backup mode 1-7
base plate ..... v, 1-3, 4-7

C

calibration 3-5
Calibrator 1-4
CF card 1-8, 2-15
channel number 2-4
chattering 1-14
commercial power noise 2-13
common mode voltage 1-11, 1-13
common specifications 4-1
communication commands 3-9
communication errors 3-2
communication status 2-12
communications 1-5
compensation lead 2-7
computation 1-6
contact input 2-8
cutoff frequency 2-14

D

data, saving of 1-8
DC current input 2-7
DC voltage input 2-7
DC voltage standard 3-5, 3-7
de-energize 1-15
decade resistance box 3-5
DI input (contact) 2-7
difference computation 1-6
differential low limit alarm 1-6
differential upper limit alarm 1-6
digital input module ..... v, 2-8
digital output module ..... v, 2-8
DIN rail 2-3
DIN rail mount bracket 2-3
dipswitch 1-5, 2-12

E

eject lever 2-15
energize 1-15
error display 3-1
errors at power on 3-1
Ethernet cable 2-11
Ethernet port 2-11

F

filter 1-6, 1-11, 1-13, 1-14
first-order lag filter 1-6, 2-14

H

hold 1-15
hold behavior 1-15
hysteresis 1-7

I

idle mode 1-7
initialization 2-12
input type 1-10, 1-12
input/output module 1-2
installation 2-2
installation location 2-2
installation procedure 2-3
instrument number iv
integrating A/D converter 2-13
Integration Monitor 1-3
integration time 1-11, 1-13

L

latch lever 2-3
lead wire resistance 2-7
LED 1-7, 3-1
linear scaling 1-6
LINK LED 2-12
log file 1-9
low-pass filter 2-14
lower limit alarm 1-6

M

MAC address iv
main module ..... iv, 1-2, 1-5, 4-2
maintenance 3-8
maintenance and test 3-9
maintenance of parts 3-8
maintenance/test commands 3-9
measurement interval 1-11, 1-13, 1-14
measurement mode 1-7
measurement range 1-10, 1-12
measurement range, calibration of 3-5
measurement synchronization 1-11, 1-13
measurement time 1-6
measures against noise 2-13
mechanical specifications 4-1
media-related errors 3-2

metal for discharging the static electricity 2-15
model iv
module, attachment of 2-4
module connector 2-4
module errors 3-2
MX100 Standard Software 1-1, 1-3
MXLOGGER ..... vi, 1-1

N

name plate iv
NO. (instrument number) iv
noise rejection filter 1-11, 1-13
non-hold 1-15

O

one-to-N connection 1-1
one-to-one connection 1-1
operation mode 1-7
optional accessories (sold separately) vi
output command help 3-11
output connection information 3-10
output Ethernet statistical information 3-10
output network information 3-11
output relay 1-15
output type 1-15
output update interval 1-15

P

panel mount 2-3
parts, maintenance of 3-8
PC software 1-3
power cord 2-9
power frequency noise 2-13
power supply connection 2-9
power supply terminal 2-10
power switch 2-10

Q

quit maintenance/test 3-12

R

rack mount 2-3
reference junction compensation 3-7
relay action 1-15
remote RJC 1-6
RTD input 2-7

S

screw terminal block 2-5
service life 3-8
settings, initialization of 2-12
shunt resistance 2-7
signal wires, connection of 2-5
slot cover 2-15
specifications 4-8
  10-CH, High-Speed Digital Input Module 4-17
  10-CH, Medium-Speed Digital Output Module 4-18
  10-CH, Medium-Speed Universal Input Module 4-12
  4-CH, High-Speed Universal Input Module 4-8
  base plate 4-7
  main module 4-2
standard accessories v
standard operating conditions 4-1
standards, supported 4-1
style number iv
suffix code iv
synchronization 1-5
synchronization between modules 1-5
system errors 3-1

T

temperature measurements, calibration of 3-7
terminal arrangement markings 2-5
terminal block 2-5
terminal cover 2-5
terminal emulator 3-9
thermocouple input 2-7
time constant 1-6, 2-14
transistor input 2-8
transport and storage conditions 4-1
troubleshooting 3-3

U

unit number 1-7
universal input module ..... iv, 2-7
upper limit alarm 1-6

V

Viewer 1-4

W

wiring procedure 2-7

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